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A. E. S.

THE TRANSACTIONS

OF THE

MEDICO-CHIRURGICAL SOCIETY

OF EDINBURGH

VOL. XXI.—NEW SERIES

SESSION 1901-1902

1902

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PREFACE

THE present Volume is the *Twenty-first* of the *New Series*, and contains a record of the work done during the past Session.

That work, as hitherto, embraces the communication of Original Papers; the exhibition of Patients, illustrating rare and interesting forms of disease; and the exhibition of Pathological and other Specimens, so essential to the proper understanding of the morbid changes which take place in the human body.

During the past Session Extra Meetings were held for the exhibition of Patients, Pathological Specimens, Instruments, etc. It is hoped that such Meetings will materially increase the usefulness of the Society.

Two of the Extra-Clinical Meetings were held in Hospitals, one in the Royal Infirmary, and the other in the Royal Hospital for Sick Children, both of which were very successful.

It is believed that the publication of the Transactions in this permanent form will prove a valuable contribution to medical literature, will encourage the Members to take a more active part in the work of the Society, and will tend in no small degree to increase the influence and usefulness of the Medico-Chirurgical Society of Edinburgh.

A general Index to the first Twenty Volumes of the New Series has just been published. It is uniform with the other Volumes.

WILLIAM CRAIG,
Editor.

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10	Dr E. F. Armour, 149 Bruntsfield Place,	1890
	Dr Andrew Balfour, 13 Walker Street,	1895
	Dr J. W. Ballantyne, 24 Melville Street,	1885
	Dr A. H. Freeland Barbour, 4 Charlotte Square,	1881
	Joseph Bell, Esq., 2 Melville Crescent,	1862
15	Dr G. A. Berry, 31 Drumsheugh Gardens,	1883
	Dr R. J. A. Berry, 4 Howard Place,	1893
	Dr Alexander Black, 13 Howe Street,	1883
	Dr W. T. Black, 2 George Square,	1877
	Dr Robert H. Blaikie, 10 Mayfield Gardens	1883
20	Dr Bleloch, 2 Lonsdale Terrace,	1871
	Dr G. P. Boddie, 73 Bruntsfield Place,	1888
	William Booth, Esq., 2 Minto Street,	1888
	Dr John M. Bowie, 6 Hope Park Crescent,	1901
	Dr F. D. Boyd, C.M.G., 6 Atholl Place,	1891
25	Dr Byrom Bramwell, 23 Drumsheugh Gardens,	1876
	Dr Edwin Bramwell, 2 Randolph Place,	1900
	Dr N. T. Brewis, 23 Rutland Street,	1886
	Dr J. J. Graham Brown, 3 Chester Street,	1878
	Dr J. Murdoch Brown, 9 Walker Street,	1885
30	Dr Alexander Bruce, 8 Ainslie Place,	1883
	Dr Lewis C. Bruce, The Asylum, Murthly, Perthshire,	1895
	Dr A. H. Buchan, 42 Heriot Row,	1899
	Dr Buist, 1 Clifton Terrace,	1877
	Dr Wm. Hartley Bunting, 74 Bruntsfield Place,	1900
35	Dr T. M. Burn-Murdoch, 14 Charlotte Square,	1886
	Dr Cadell, 22 Ainslie Place,	1870
	Francis M. Caird, Esq., 13 Charlotte Square,	1883
	Dr H. L. Calder, 60 Leith Walk, Leith,	1884
	Dr James Cameron, 13 Fettes Row,	1895
40	Dr Edward Carmichael, 21 Abercromby Place,	1887
	Dr E. W. Scott Carmichael, 6 Castle Terrace,	1901
	Dr J. Carmichael, 22 Northumberland Street,	1870
	Dr William Carmichael, 25 Braid Road,	1900
	Dr George J. R. Carruthers, 4A Melville Street,	1901
45	C. W. Cathcart, Esq., 8 Randolph Crescent,	1883
	Dr J. G. Cattanach, 3 Alvanley Terrace,	1895
	Dr T. F. S. Caverhill, 16 Randolph Crescent,	1883
	Dr George L. Chiene, 23 Alva Street,	1901
	Professor John Chiene, C.B., 26 Charlotte Square,	1867
50	Dr Church, 36 George Square,	1876
	Dr J. A. Clark, 4 Cambridge Street,	1893
	Dr Clouston, Tipperlinn House, Morningside Place,	1861

		Date of Admission.
	J. M. Cotterill, Esq., 24 Manor Place,	1878
	Dr John Craig, 71 Bruntsfield Place,	1900
55	Dr William Craig, 71 Bruntsfield Place,	1869
	Sir John Halliday Croom, 25 Charlotte Square,	1870
	Dr G. Matheson Cullen, 48 Lauriston Place,	1892
	Dr A. S. Cumming, 18 Ainslie Place,	1884
	Dr John Cumming, 20 Gilmore Place,	1894
60	Dr R. J. Blair Cunynghame, 18 Rothesay Place,	1868
	Dr T. B. Darling, 13 Merchiston Place,	1887
	Dr G. D. Darlington, 10 Ardmillan Terrace,	1898
	Dr M. Dewar, 24 Lauriston Place,	1885
	Dr J. T. Dickie, 37 Lauriston Place,	1900
65	Dr George Dickson, 9 India Street,	1884
	Dr George Dickson, 14 Ardmillan Terrace,	1901
	Dr C. E. Douglas, Cupar-Fife,	1894
	Dr Kenneth M. Douglas, 19 Chester Street,	1888
	Dr W. B. Dow, Dunfermline,	1879
70	Dr J. W. Dowden, 27 Walker Street,	1893
	Dr W. B. Drummond, 9 Brougham Place,	1900
	Dr James K. Drysdale, 22 Coltbridge Terrace,	1901
	Dr John A. H. Duncan, 32 Morningside Drive,	1895
	Dr Kirk Duncanson, 22 Drumsheugh Gardens,	1871
75	Dr H. M. Dunlop, 20 Abercromby Place, *Secretary*,	1883
	Dr J. C. Dunlop, 33 Chester Street,	1892
	Dr J. Dunsmure, 53 Queen Street,	1872
	Dr John Eason, 196 Newhaven Road,	1900
	Dr C. C. Easterbrook, Glengall, Ayr,	1899
80	Dr William Elder, 4 John's Place, Leith,	1892
	Dr J. Haig Ferguson, 25 Rutland Street,	1885
	Dr W. A. Finlay, 50 Trinity Road,	1875
	Dr R. A. Fleming, 10 Chester Street,	1890
	Dr A. Dingwall Fordyce, 15 Melville Street,	1901
85	Dr J. S. Fowler, 68 Northumberland Street,	1895
	Dr John Fraser, 13 Heriot Row,	1878
	Dr J. Hossack Fraser, Fernfield, Bridge of Allan,	1895
	Professor Sir Thomas R. Fraser, 13 Drumsheugh Gardens, *President*,	1865
	Dr F. Gardiner, 40 Rankeillor Street,	1900
90	Dr Garland, 53 Charlotte Street, Leith,	1873
	Dr G. A. Gibson, 3 Drumsheugh Gardens,	1880
	Dr A. B. Giles, 4 Palmerston Place,	1893
	Dr A. Lockhart Gillespie, 12 Walker Street,	1891
	Dr Alexander Goodall, 48 Fountainhall Road,	1901
95	Dr D. J. Graham, 28 Gilmore Place,	1897
	Dr F. M. Graham, 16 Mayfield Gardens,	1894
	Dr J. Taylor Grant, 3 Manor Place,	1898
	Dr J. Allan Gray, 107 Ferry Road,	1879
	Dr T. Paul Gray, 6 St Catherine's Place,	1899
100	Professor Greenfield, 7 Heriot Row,	1886
	David M. Greig, Esq., 25 Tay Street, Dundee,	1892
	Dr G. L. Gulland, 6 Alva Street,	1888
	Dr A. C. Guthrie, 171 Constitution Street, Leith,	1890
	Dr William Guy, 11 Wemyss Place,	1890
105	Dr William Haldane, Viewforth, Bridge of Allan,	1889
	Dr George Halley, 7 Airlie Place, Dundee,	1902
	Dr D. Berry Hart, 29 Charlotte Square,	1886
	Dr James Harvey, 7 Blenheim Place,	1893
	Dr Henry Hay, 19 Nelson Street,	1884
110	J. W. B. Hodsdon, Esq., 6 Chester Street,	1883
	Dr George Hunter, 33 Palmerston Place,	1876
	Dr David Huskie, Moffat,	1899
	Dr J. Hutcheson, 44 Moray Place,	1890

		Date of Admission
	Dr R. W. Inkster, 16 Windsor Street,	1895
115	Dr Alex. James, 10 Melville Crescent,	1877
	Dr Allan Jamieson, 35 Charlotte Square,	1876
	Dr Hugh Jamieson, 13 Rutland Street,	1889
	Dr James Jamieson, 43 George Square,	1877
	Dr J. Boyd Jamieson, 43 George Square,	1900
120	Dr G. M. Johnston, 7 Wellington Place, Leith,	1888
	Dr R. J. Johnston, 1 Buccleuch Place,	1897
	Dr R. M'Kenzie Johnston, 2 Drumsheugh Gardens,	1883
	Dr C. Kennedy, 5 Salisbury Road,	1886
	Dr C. B. Ker, City Fever Hospital,	1894
125	Dr George Kerr, 6 St Colme Street,	1885
	Dr J. H. A. Laing, 11 Melville Street,	1889
	Dr H. G. Langwell, 4 Hermitage Place, Leith,	1899
	Dr David Lawson, Nordrach-on-Dee, Banchory,	1901
	Dr H. A. Leebody, Corstorphine,	1899
130	Dr Linton, 60 George Square,	1863
	Dr Edwin M. Lithgow, 8 Alva Street,	1901
	Dr John D. Lithgow, 8 Alva Street,	1901
	Dr Harvey Littlejohn, 1 Atholl Crescent, *Treasurer*,	1889
	Professor Sir Henry D. Littlejohn, 24 Royal Circus,	1853
135	Dr G. R. Livingston, 35 George Street, Dumfries,	1901
	Dr T. Davy Luke, 95 Shandwick Place,	1900
	Dr R. A. Lundie, 55A Grange Road,	1883
	Dr D. C. A. M'Allum, 31 Alva Street,	1900
	Dr P. M'Bride, 16 Chester Street,	1879
140	Dr W. A. M'Cutchan, County and City Asylum, Burghill, Hereford,	1897
	Dr K. N. Macdonald, 21 Clarendon Crescent,	1880
	Dr Stuart M'Donald, New School, Bristo Street,	1901
	John M'Gibbon, Esq., 55 Queen Street,	1868
	Dr John M'Gibbon, Junr., 55 Queen Street,	1899
145	Dr C. W. MacGillivray, 15 Charlotte Square,	1877
	Dr G. Mackay, 74 Bruntsfield Place,	1878
	Dr George Mackay, 20 Drumsheugh Gardens,	1887
	Dr Robert Mackenzie, Napier, Nairn,	1893
	Dr W. Leslie Mackenzie, 1 Stirling Road, Trinty,	1895
150	Dr William A. Mackintosh, 3 Park Terrace, Stirling,	1896
	Dr David W. Maclagan, 91 Comely Bank Avenue,	1901
	Dr J. Shaw M'Laren, 14 Walker Street,	1887
	Dr P. Hume Maclaren, 1 Drumsheugh Gardens,	1868
	Dr Malcolm M'Larty, 7 Bellevue Place,	1900
155	Dr John Macmillan, 48 George Square,	1897
	Dr Alexander H. Macpherson, 3 Dalziel Place,	1901
	Dr John Macpherson, 8 Darnaway Street,	1891
	Dr John MacRae, Lynwood, Murrayfield,	1893
	Dr Samuel Macvie, Chirnside,	1897
160	Dr A. A. Matheson, 41 George Square,	1901
	Dr Edwin Matthew, 4 John's Place, Leith,	1900
	Dr D. Menzies, 20 Rutland Square,	1878
	Dr A. Miles, 20 Walker Street,	1892
	Dr J. Mill, 26 N. Fort Street, Leith,	1886
165	A. G. Miller, Esq., 7 Coates Crescent,	1867
	Dr W. H. Miller, 51 Northumberland Street,	1895
	Dr D. Milligan, 11 Palmerston Place,	1885
	Sir Arthur Mitchell, 34 Drummond Place,	1859
	Dr J. E. Moorhouse, 1 Glebe Avenue, Stirling,	1901
170	Dr James Mowat, 24 Minto Street,	1893
	Dr John Mowat, 6 Buccleuch Place,	1885
	Dr Claud Muirhead, 30 Charlotte Square,	1866
	Dr R. Milne Murray, 11 Chester Street,	1884
	Dr H. Oliphant Nicholson, 20 Manor Place,	1900

		Date of Admission.
175	Dr John Orr, 1 Rillbank Crescent,	1895
	Dr W. Basil Orr, 13 Braid Road,	1893
	Dr G. Keppie Paterson, 19 Albany Street,	1889
	Dr J. V. Paterson, 5 Castle Terrace,	1900
	Dr D. Noël Paton, 22 Lynedoch Place,	1885
180	Dr C. M. Pearson, 17 Alva Street,	1902
	Dr H. A. Peddie, 24 Palmerston Place,	1893
	Dr R. W. Philip, 45 Charlotte Square,	1883
	Dr Playfair, 5 Melville Crescent,	1874
	Dr T. Proudfoot, 30 Lauriston Place,	1889
185	Dr R. B. Purves, 17 Walker Street,	1899
	Dr Harry Rainy, 16 Great Stuart Street,	1896
	Dr Rattray, Portobello,	1874
	Dr James Ritchie, 22 Charlotte Square, *Vice-President*,	1873
	Dr W. T. Ritchie, 9 Atholl Place,	1900
190	Dr Argyll Robertson, 18 Charlotte Square,	1861
	Dr G. M. Robertson, The Copse, Larbert,	1890
	Dr Robert Robertson, 26 Royal Circus,	1901
	Dr William Robertson, 11 Denham Green Terrace, Trinity,	1902
	Dr William F. Robertson, 20 Dalrymple Crescent,	1893
195	Dr W. G. Aitchison Robertson, 26 Minto Street,	1892
	Dr R. M. Ronaldson, 17 Morningside Road,	1895
	Dr T. R. Ronaldson, 8 Charlotte Square,	1877
	Dr William Russell, 3 Walker Street,	1884
	Dr J. M. Rutherford, Morningside Royal Asylum,	1900
200	Dr E. G. Salt, 59 George Square,	1895
	Dr James Scott, 43 Minto Street,	1895
	Dr Andrew Semple, 10 Forres Street,	1883
	Dr Theodore Shennan, 95 Mayfield Road,	1897
	Sir John Sibbald, 18 Great King Street,	1859
205	Dr W. C. Sillar, 46 George Square,	1900
	Professor Simpson, 52 Queen Street,	1859
	Dr G. F. Barbour Simpson, 50 Melville Street,	1900
	Dr John W. Simpson, 15 Glanville Terrace,	1901
	Dr Arthur H. H. Sinclair, 5 Walker Street,	1900
210	Dr A. A. Scot Skirving, C.M.G., 29 Drummond Place,	1897
	Dr A. T. Sloan, 22 Abercromby Place,	1885
	Dr Andrew Smart, 15 Rutland Square,	1865
	Dr G. D. Smith, 148 Ferry Road,	1877
	Dr James Smith, 1 Parson's Green Terrace,	1891
215	Dr John Smith, 11 Wemyss Place,	1856
	Dr J. Cormack Smith, 9 Brunton Place,	1896
	Dr J. W. Steven, 13 Manor Place,	1900
	Dr John Stevens, 2 Shandon Street,	1892
	Dr John Stevenson, 18 Coates Crescent,	1900
220	Dr J. S. Stewart, 15 Merchiston Place,	1885
	Dr Robert Stewart, 42 George Square,	1892
	Dr William Stewart, 146 Ferry Road, Leith,	1889
	H. J. Stiles, Esq., 8 St Colme Street,	1889
	Dr S. Stirling, 4 Coates Crescent,	1891
225	Dr John Strachan, Dollar,	1867
	Dr John W. Struthers, 13 Alva Street,	1901
	Dr Allan C. Sym, 144 Morningside Road,	1889
	Dr William G. Sym, 20 Alva Street,	1889
	Dr W. Taylor, 12 Melville Street,	1871
230	Dr C. C. Teacher, 8 Nile Grove,	1887
	Dr C. H. Thatcher, 8 Melville Crescent,	1876
	Dr R. Thin, 38 Albany Street,	1890
	Dr J. A. Douglas Thompson, Barmeal, Port-William, Wigtownshire,	1901
	Mr Alexis Thomson, 39 Drumsheugh Gardens, *Secretary*,	1887
235	Dr H. Torrancee Thomson, 7 Leopold Place,	1900

		Date of Admission.
	Dr John Thomson, 14 Coates Crescent,	1887
	Dr T. J. Thyne, 2 Dean Terrace,	1898
	Dr John Tod, 93 Ferry Road, Leith,	1895
	Sir John Batty Tuke, M.P., 20 Charlotte Square,	1864
240	Dr F. J. Turnbull, 6 Randolph Place,	1896
	Dr Dawson Turner, 37 George Square,	1890
	Dr Logan Turner, 27 Walker Street,	1892
	Dr Underhill, 8 Coates Crescent, *Vice-President*,	1872
	Dr Norman Walker, 7 Manor Place,	1891
245	Mr D. Wallace, C.M.G., 11 Rutland Street,	1887
	Dr David Waterston, 23 Colinton Road,	1900
	Dr Douglas Chalmers Watson, 22 Coates Crescent,	1894
	Dr P. H. Watson, 16 Charlotte Square,	1856
	Dr N. P. Watt, 1 Denham Green Terrace, Trinity,	1898
250	Dr A. D. Webster, Belleville Lodge, Blacket Avenue,	1883
	Dr D. A. Welsh, 6 Mardale Crescent,	1900
	Dr James Wilson, 53 Inverleith Row,	1900
	J. L. Wilson, Esq., 4 Buccleuch Place,	1883
	Dr T. D. Wilson, 10 Newington Road,	1880
255	Dr Russell E. Wood, 9 Darnaway Street,	1883
	Dr W. Fraser Wright, Bonnington Mount, Bonnington Ter.,	1894
	Professor John Wyllie, 44 Charlotte Square,	1868
	Dr P. A. Young, 25 Manor Place,	1870

(*b*) Members Exempted under Rule V. from paying the Annual Subscription.

	Dr D. Aitken, 152 *Packington Street, Islington, London, N.*,	1887
260	Dr D. H. Anderson, 131 *Abbey Road, Barrow-in-Furness*,	1887
	Dr Archibald, *Hazelden, Wimborne Road, Bournemouth*,	1882
	Dr J. A. Armitage, 28 *Waterloo Road South, Wolverhampton*,	1887
	Dr W. Badger, *Penicuik*,	1882
	Dr Edwin Baily, *Oban*,	1883
265	Dr Andrew Balfour, *Portobello*,	1874
	Dr G. W. Balfour, *Westfield, Colinton*,	1847
	Dr J. H. Balfour, *Portobello*,	1881
	Dr Alexander Ballantyne, *Dalkeith*,	1872
	Dr Harold S. Ballantyne, *Dalkeith*,	1899
270	Dr Noel D. Bardswell, *Banchory*,	1901
	Dr W. H. Barrett, 29 *Park Crescent, Hesketh Park, Southport*,	1890
	Dr George T. Beatson, 7 *Woodside Crescent, Glasgow*,	1895
	Surgeon-Captain C. H. Bedford, *Bengal Army, care of W. Watson & Co.*, 28 *Apollo Street, Bombay*,	1889
	Dr Charles Begg, 62 *Pultenery Street, Bath*,	1900
275	Dr Benjamin D. C. Bell, *Kirkwall*,	1889
	Dr G. J. H. Bell, *Bengal Army*,	1884
	Dr G. H. Bentley, *Kirkliston*,	1877
	Dr J. S. Beveridge, *Melton Constable, Norfolk*,	1861
	Dr J. W. Black, 15 *Clarges Street, Piccadilly, London, W.*,	1865
280	Dr P. G. Borrowman, *Viewfield, Crieff*,	1893
	Dr D. G. Braidwood, *Halkirk, Caithness*,	1889
	Dr David Brodie, 68 *Hamilton Road, Highbury Park, London*,	1865
	Dr Andrew Brown, 1 *Bartholomew Road, Kentish Town, London, N.W.*,	1884
	Dr John Brown, *Stockbridge House, Padiham, Lancashire*,	1878
285	Dr J. Macdonald Brown, 2 *Fragnall, West Hampstead, London, N.W.*,	1883
	Dr D. A. Carruthers, 12 *Rose Terrace, Perth*,	1901

		Date of Admission
	Dr S. W. Carruthers, 44 *Central Hill, Norwood, London, S.E.*,	1899
	Dr R. D. Clarkson, *Falkirk*,	1896
	Professor Cleland, *The University, Glasgow*,	1864
290	Dr A. R. Coldstream, 24 *Lung Arno Nuovo, Florence, Italy*,	1878
	Dr William Craig, *Cowdenbeath, Fife*,	1894
	Dr J. R. Crease, 2 *Ogle Terrace, South Shields*,	1885
	Dr J. Frank Crombie, *North Berwick*,	1897
	Dr P. M. Deas, *Wonford House, Exeter*,	1868
295	Dr A. Halliday Douglas, 12 *Dean Park Crescent, Haddington*,	1842
	Dr A. Home Douglas, 5 *Rue de Russie, Nice, France*,	1889
	Dr J. J. Douglas, 42 *Centrall Hill, Upper Norwood, London*,	1891
	* Dr Thomas Easton, 28 *East Park Terrace, Southampton*,	1894
	Dr J. W. Eastwood, 4 *Bevington Road, Oxford*,	1871
300	Dr F. A. Elkins, *The Asylum, Leavesden, near King's Langley*,	1893
	Dr R. W. Felkin, 48 *Westbourne Gardens, Bayswater, London, W.*,	1885
	Dr Samuel Fergusson, *Lylestone House, Alloa*,	1902
	Sir R. B. Finlay, Q.C., M.P., LL.D., *Middle Temple, London*,	1864
	Dr Simson C. Fowler, *Juniper Green*,	1892
305	Dr F. W. Foxcroft, 47 *Newhall Street, Birmingham*,	1893
	Dr Dyce Fraser, *The White House, Teddington*,	1883
	Professor Gamgee, 8 *Avenue de la Garve, Lausanne, Switzerland*,	1863
	Dr William Gayton, *Bartram Lodge, Fleet Road, Hampstead, London, N.W.*,	1886
	Dr W. C. Greig, *Otago, New Zealand*,	1884
310	Dr George K. Grimmer, *Canada*,	1897
	Dr Groesbeck, *Cincinnati*,	1875
	Dr W. B. T. Gubbin, *Redland Grove, Bristol*,	1893
	Dr John Haddon, *Denholm, Roxburghshire*,	1883
	Dr Archibald Hall, *Montreal*,	1853
315	Professor D. J. Hamilton, *The University, Aberdeen*,	1876
	Dr J. W. Hamp, *Penn Road, Wolverhampton*,	1887
	Dr John Hardie,	1895
	Dr A. W. Hare, *Newquay, Cornwall*,	1883
	Dr J. Home-Hay, *Alloa*,	1880
320	Professor J. Berry Haycraft, 1 *St Andrew's Place, Cardiff*,	1889
	Dr Stanley Haynes, *Malvern, Worcestershire*,	1864
	Dr R. Dundas Helm, 3 *Alfred Street N., Portland Square, Carlisle*,	1892
	Dr R. E. Horsley, *Jud-Falls, Stoneyhurst, Lancashire*,	1886
	Dr James Hunter, *St Catherine's, Linlithgow*,	1890
325	Dr W. Hunter, 103 *Harley Street, Cavendish Square, London, W.*,	1887
	Dr Robert Inch, *Gorebridge*,	1887
	Dr W. Wotherspoon Ireland, 1 *Victoria Terrace, Musselburgh*,	1883
	Dr J. Carlyle Johnstone, *The Asylum, Melrose*,	1882
	Dr D. W. Johnston, *P.O. Box 2022, Johannesburg, South Africa*,	1893
330	Dr James Johnston, 53 *Princes Square, Bayswater, London, W.*,	1871
	Dr J. Keay, *District Asylum, Inverness*,	1887
	Dr A. J. Keiller, *New Brunswick, Canada*,	1889
	Dr George Keith, *Moidart Cottage, Currie*,	1845
	Dr Skene Keith, 42 *Charles Street, Berkeley Square, London, W.*,	1885
335	Dr W. Scott Lang,	1886
	Dr J. W. Leech, 12 *Eldon Square, Newcastle-on-Tyne*,	1901
	Professor R. F. C. Leith, M.B., *Mason University College, Birmingham*,	1886
	Dr Herbert Littlejohn, *Townhall, Hampstead, London, N.W.*,	1892
	Dr Robert Lucas, *Dalkeith*,	1875

		Date of Admission
340	Dr Donald Macaulay, *Jumpers' Gold Mining Co., P.O. Box 1043, Johannesburg,*	1895
	Dr F. R. Macdonald, *Inveraray,*	1860
	Dr W. B. Macdonald, *Dunbar,*	1888
	Dr John A. Macdougall, *Cannes, France,*	1875
	Dr William C. M'Ewan, *Prestonpans,*	1892
345	Professor J. M'Fadyean, 101 *Great Russell Street, London, W.C.,*	1888
	Dr F. Reid Mackay, 27 *York Place, Harrogate,*	1899
	Dr John Mackay, *Aberfeldy,*	1881
	Dr W. B. Mackay, 23 *Castlegate, Berwick-on-Tweed,*	1893
	Professor M'Kendrick, *The University, Glasgow,*	1870
350	Dr James Mackenzie, 68 *Bank Parade, Burnley, Lancashire,*	1894
	Dr T. J. Maclagan, 9 *Cadogan Place, Belgrave Square, London, S.W.,*	1875
	Dr Roderick M'Laren, 23 *Portland Square, Carlisle,*	1882
	Dr William B. MacTier, 7 *Queen's Gardens, St Andrews,*	1901
	Dr J. W. Martin, *Burnfoot, Cluden, Dumfries,*	1888
355	Dr A. Matthew, *Corstorphine,*	1882
	Dr Andrew W. Messer, *Lenington, Scotswood-on-Tyne,*	1899
	Dr James Middlemass, *Boro' Asylum, Ryhope, Sunderland,*	1895
	Dr E. A. Mills-Roberts, *Bryn Meurig, Bethesda, Bangor,*	1897
	Dr J. Moolman, *Cape of Good Hope,*	1877
360	Dr E. C. Moore,	1892
	Dr A. E. Morison, *Wellington Road, West Hartlepool,*	1889
	Dr J. Rutherford Morison, 14 *Saville Row, Newcastle-on-Tyne,*	1882
	Professor Robert Muir, *The University, Glasgow,*	1894
	Dr D. G. Macleod Munro, 1 *Oriel Villas, Cheltenham,*	1898
365	Dr J. Ivor Murray, 58 *Addison Mansions, Kensington, London, W.,*	1857
	Dr Andrew Scott Myrtle, *Harrogate,*	1859
	Dr Leith Napier, *The General Hospital, Adelaide, South Australia,*	1879
	Dr T. Goodall Nasmyth, *Cupar-Fife,*	1884
	Dr Ernest F. Neve, *Srinagar, Kashmir, India,*	1884
370	Dr Peter Orphoot, *Greenhythe, North Berwick,*	1865
	Dr T. Wyld Pairman, *H.M. Prison, Lyttelton, New Zealand,*	1884
	Professor Bell Pettigrew, *St Andrews,*	1873
	Dr Alexander Peyer, *Zürich,*	1893
	Dr J. A. Philip, *Rue Victor Hugo, Boulogne-Sur-Mer, France,*	1878
375	Professor W. S. Playfair, 38 *Grosvenor Street, London, W.,*	1857
	Dr J. H. Pringle, 172 *Bath Street, Glasgow,*	1886
	Dr S. Hale Puckle, *Bishop's Castle,*	1885
	Dr J. Maxwell Ross, *St Ruth's, Maxwelltown, Dumfries,*	1882
	Dr J. R. Home Ross, *Burmah,*	1888
380	Dr Joseph C. Ross, *Withington,*	1884
	Dr S. Rumboll, *Cavendish House, Leeds,*	1887
	Dr Thomas Russell, 27A *Westmuir Street, Parkhead, Glasgow,*	1888
	Dr Gordon Sanders, *Cannes, France,*	1892
	Dr F. A. Saunders, *Grahamstown, South Africa,*	1884
385	Dr Thomas R. Scott, *Musselburgh,*	1884
	Dr C. A. E. Sheaf, *Ovalu, Fiji,*	1871
	Dr G. F. Shiels, 229 *George Street, San Francisco,*	1887
	Dr W. H. Shirreff, *Port Fairy, Victoria, Australia,*	1883
	Dr William Simmers, *Denburn, Crail,*	1894
390	Dr T. Skinner, 6 *York Place, Portman Square, London, W.,*	1856
	Dr John Smith, *Brycehall, Kirkcaldy,*	1889
	Dr William Smith, *America,*	1890
	Dr W. Ramsay Smith, *The General Hospital, Adelaide, South Australia,*	1892

		Date of Admission.
	Dr Van Someren, *Northwood, Middlesex*,	1845
395	Dr Somerville, *Galashiels*,	1877
	Dr A. M. Stalker, 140 *Nethergate, Dundee*,	1893
	Dr Graham Steell, 96 *Moseley Street, Manchester*,	1877
	Professor Stephenson, *University, Aberdeen*,	1861
	Dr Robert Stirling, 4 *Atholl Place, Perth*,	1891
400	Professor Ralph Stockman, *The University, Glasgow*,	1891
	Dr H. R. Storer, *Newport, Rhode Island, U.S.*,	1855
	Dr John Struthers, *Nqamakwe, Transkei, South Africa*,	1895
	Dr C. A. Sturrock, *Dunfermline*,	1894
	Dr J. F. Sturrock, *Arima, Broughty Ferry*,	1887
405	Professor J. Symington, *Queen's College, Belfast*,	1878
	Dr C. Templeman, *Sanitary Office, Bell Street, Dundee*,	1891
	Dr Thin, 63 *Harley Street, Cavendish Square, London, W.*,	1861
	Dr Alexander Thom, *Gowanlea, Peebles*,	1884
	Dr J. Stitt Thomson, *The Mount, Lincoln*,	1877
410	Dr J. Batty Tuke, jr., *Balgreen, Murrayfield*,	1886
	Dr R. S. Turner, *Keith*,	1867
	Dr T. Edgar Underhill, *Dunedin, Burnt Green, Worcestershire*,	1885
	Dr A. R. Urquhart, *Murray House, Perth*,	1893
	Dr Gopal Govind Vatve, *care of H.H. the Rajah of Miraj, Bombay, India*,	1895
415	Dr A. B. Whitton, *Aberchirder*,	1886
	Dr George R. Wilson, *Mavisbank, Polton*,	1892
	Professor G. Sims Woodhead, *Pathological Laboratory, New Museums, The University, Cambridge*,	1883
	Dr Yellowlees, 6 *Albert Gate, Dowanhill, Glasgow*,	1862
	Professor John Young, *The University, Glasgow*,	1860

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TRANSACTIONS

OF THE

MEDICO-CHIRURGICAL SOCIETY OF EDINBURGH

FOR SESSION LXXX., 1901-02

Meeting I.—November 6th, 1901

MR A. GORDON MILLER, *President, in the Chair*

I. ELECTION OF OFFICE-BEARERS

The following gentlemen were elected office-bearers:—*President*, Professor T. R. Fraser, M.D., LL.D.; *Vice-Presidents*, Dr James Andrew, Dr Charles E. Underhill, and Dr James Ritchie; *Council*, Drs John W. Ballantyne, George Kerr, Kenneth M. Douglas, H. J. Stiles, A. G. Miller, William Russell, D. Noël Paton, and Logan Turner; *Treasurer*, H. Harvey Littlejohn; *Secretaries*, Dr H. Melville Dunlop and Mr Alexis Thomson; *Editor of Transactions*, Dr William Craig.

II. ELECTION OF MEMBERS

The following were elected Ordinary Members of the Society:—John W. Simpson, M.B., 15 Granville Terrace; A. A. Matheson, M.D., F.R.C.P.Ed., 41 George Square; J. W. Struthers, M.B., F.R.C.S.Ed., 13 Alva Street; A. H. Macpherson, L.R.C.P. and S. Ed., 3 Dalziel Place; E. M. Lithgow, M.B., Ch.B., 8 Alva Street; J. D. Lithgow, M.B.,

C.M., 8 Alva Street; J. K. Drysdale, M.B., C.M., 22 Coltbridge Terrace; E. Scott Carmichael, M.B., F.R.C.S.Ed., 6 Castle Terrace; R. Robertson, M.B., C.M., 26 Royal Circus; and J. M. Bowie, M.D., 8 Hope Park Crescent.

III. Treasurer's Annual Statement

EDINBURGH MEDICO-CHIRURGICAL SOCIETY'S ACCOUNTS

FOR SESSION 1900-1901

INCOME				£	s.	d.
Entrance Fees	£39	18	0			
Annual Subscriptions	120	10	0			
Annual Subscriptions, Arrears	1	0	0			
Subscriptions for Transactions	2	0	0			
Sale of Transactions	3	9	4			
Half-year's Interest on Caledonian Railway Stock	6	12	9			
Interest on Deposit Receipts	5	16	7			
	£179	6	8	£179	6	8
Withdrawn from Deposit Receipt in Bank (£500, plus interest due, £1, 4s. 7d.)				501	4	7
Balance in Bank at November 1900				23	0	7
				£703	11	10

EXPENDITURE				£	s.	d.
Edinburgh Medical and Surgical Journal	£2	2	0			
Printing Vol. XIX. of Transactions	57	13	5			
Collector	4	0	0			
Medical Directories	1	1	0			
General Printing	17	1	6			
Stationery	7	19	4			
Tea and Coffee	5	6	8			
Hire of Microscopes	3	12	0			
Lantern Demonstrations	2	11	6			
Rent of Hall	10	0	0			
Doorkeeper	1	0	0			
Petty Disbursements	2	15	0			
	£115	2	5	£115	2	5
Purchase of £350 four per cent. Caledonian Railway Debenture Stock				484	11	6
Placed on Deposit Receipt				100	0	0
Balance on Current Account				3	17	11
				£703	11	10

STATE OF FUNDS

At November 1900.				At November 1901.			
Deposit Receipts	£700	0	0	Deposit Receipts	£300	0	0
Balance in Current Account	23	0	7	Caledonian Railway Stock	484	11	6
				Balance in Current Account	3	17	11
	£723	0	7		£788	9	5

HARVEY LITTLEJOHN, *Hon. Treasurer.*

The Accounts and Vouchers have been examined and found correct. We have seen the Deposit Receipts for £300 with the British Linen Company Bank, and Share Certificate for £350 four per cent. Caledonian Railway Debenture Stock.

GEORGE HUNTER,
HARRY RAINY, } *Auditors.*

IV. Exhibition of Patients

1. *Dr H. Melville Dunlop* exhibited a little boy, an example of that rare condition called chloroma, which is a lympho sarcoma arising from the periosteum of skull. It generally originates in the orbit spreading thereafter to the other cavities of the skull, and subsequently to internal organs and to more distant parts of the body. The tumours removed from the body are in their recent appearance of a bright green colour, but this colour quickly disappears on exposure to the air.

The boy was admitted to his (Dr Melville Dunlop's) Ward six weeks ago suffering from languidness and listlessness, disclination to play or exert himseif. He was very anemic and a blood count was made which revealed a well marked lymphocytosis.

Within four weeks the lymphocytes increased from 28,000 to 64,000 and at the same time the red blood corpuscles diminished from 1,500,000 to 800,000. The eye-balls were noticed to be slightly prominent on admission, and gradually an extreme degree of exophthalmous had developed, the boy being unable to close his eyelids, the tears escaping over his cheeks.

The eyelids, both upper and lower, were infiltrated with semi-solid elastic swellings causing very great prominence. Similar swellings were present on both sides of the head due to infiltration in the substance of the temporal muscles, causing considerable prominence in those regions. An ophthalmoscopic examination revealed double optic neuritis and linear hemorrhages into the outer margins of the discs. Gradually advancing deafness had supervened. An inspection of the mouth revealed infiltration on both sides of the gums narrowing the arch of the palate, and a similar swelling was present on the left side of the lower jaw. During the last two days considerable pain had developed in the head and eyes. The patient was getting weaker ; his temperature was rising, and his pulse was becoming more rapid, and the only justification for bringing him from his bed was the extreme rarity of the disease, and the feeling that the members ought to have an opportunity of seeing the case.

2. *Dr Norman Walker* exhibited THREE CASES OF LUPUS.

(*a*) A very extensive case of lupus of the face in an elderly woman, which had been treated with great success by the X-rays. Two points were specially noted.

A. That some sloughing took place, but although the rays were not stopped, this healed up with a smooth healthy scar.

B. The patient had very marked ectropion, and under the influence of the rays, the exposed mucous membrane changed into, what was to all practical purposes, skin.

(*b*) A girl of 20, who was the first case in which he had used the rays. She had a perfect museum of the different varieties of lupus. The condition on the face had improved very much under the rays, and he had just commenced the use of the light treatment to one side.

She had a large patch on the breast, and this he had treated with almost complete success by the electric cautery. A large patch on the buttock, measuring fully 9 inches across, incised and grafted at his request by Mr Alexis Thomson; this too had done admirably. But a patch on the patient's leg, measuring 3 inches by 2½, to which practically no treatment had been used, had done almost as well as any of the others.

(*c*) A girl, aged 23, with lupus of the face, which had been treated by various methods, and which he simply showed to note the condition before commencing the light treatment.

He also showed the new lamp, a modification of Lortet and Genoud's, which was in use at the London Hospital.

3. *Mr H. J. Stiles* exhibited—

(*a*) A girl, aged years, after operation for a PLEXIFORM ANGIOMA OF THE SCALP. The tumour, which was situated over the bregma, measured 3½ by 2½ inches, and pulsated freely. It was not noticed until about a year ago when the head was shaved during a severe attack of scarlet fever; since then it is said to have enlarged considerably. The supra-orbital, temporal, and occipital arteries, on both sides, were abnormally prominent, dilated, and tortuous, and their pulsations were very visible; the corresponding veins were dilated but not tortuous. The skin over the tumour was

unaltered. It was decided to apply a ligature to the various feeding arteries and to follow this up with electrolysis of the tumour itself. Twelve vessels were ligatured. Mr Stiles desired to draw attention to the manner in which the vessels were secured, as he was not aware that the method he employed had been advocated. On account of the extreme thinness of the wall of the vessels, combined with their adhesion to the adjacent dense tissue of the skin of the scalp, it was found to be almost impossible to isolate the vessels, without wounding them, by means of an incision running parallel to them. In place of a longitudinal incision, therefore, a small incision (¾ in.) was made at right angles to the vessel, but not sufficiently deep to wound it. A small curved needle, threaded with catgut, was then passed down to the bone beneath the vessel and the latter ligatured. It was interesting to note that the tieing of the ligature brought about a very accurate approximation of the edges of the little wound so that no sutures were required. In this way all the feeding arteries were rapidly ligatured, and when the operation was completed no pulsation could be felt in the tumour. A week later, when the wounds were healed, there was a slight return of the pulsation.

(*b*) Child, aged 13 months, after operation for TUBERCULOUS DISEASE OF THE FRONTAL BONE.

On admission to hospital six weeks ago there was a large boggy prominent swelling situated over the left frontal eminence. About the centre of the swelling was a small sinus from which a dirty serous discharge escaped. Except for the sinus the skin was healthy. The swelling faded off gradually at its circumference. The left upper eyelid and the left cheek were very œdematous. The bones at the base of the swelling could be felt to be considerably thickened. The condition began three months ago, and was believed to be due to a fall upon the forehead. An abscess developed, which was incised six weeks ago. There was a strong family history of tubercle. The operation consisted in turning down a horseshoe-shaped flap and clearing away the tubercular matter so as to expose the bone. The bone itself was found to be eroded, greatly thickened, and unusually sclerosed for a tubercular condition. The outer table was chiselled away, but no diploë could be discovered. This case differed from that of which the specimen had just been

shown, in that the tubercular condition appeared to have originated underneath the pericranium rather than in the diploë, as is most frequently the case. In all probability the fall had led to some extravasation beneath the pericranium, and the bruised part had furnished a suitable nidus for hæmatogenic tubercular infection. There was no history of syphilis. The presence of a small tubercular abscess below the outer angle of the orbit in connection with the malar bone affords strong confirmation of the diagnosis.

V. Exhibition of Pathological Specimens

1. *Mr Alexis Thomson* exhibited a portion of SMALL INTESTINE, THE SEAT OF A SMALL ROUND-CELLED SARCOMA

The patient, a woman aged 48, had suffered for nine months from colic and alternating diarrhœa and constipation. When seen there was chronic incomplete obstruction with a well-marked ladder pattern and visible peristalsis of distended coils of gut. The belly was opened in the middle line; a loop of the lower end of the ileum was found to be the seat of a hard tumour, and was brought out at the wound and opened.

A fortnight later the loop of bowel was excised: the distal end was closed, and the proximal end inserted into the ascending colon. The patient made an uninterrupted recovery.

The tumour is sharply defined above and below, and involves the bowel to the extent of 7 cm. It involves all the coats and projects so as to seriously narrow the lumen of the gut.

2. *Mr H. J. Stiles* exhibited—

(*a*) The calvarium of a child, aged 10 months, who suffered from MULTIPLE TUBERCULOUS OSTEOMYELITIS OF THE CRANIUM. The child was in good health until it was seven months old, when a small lump appeared on the left parietal region; this was followed by similar swellings in the occipital region and both frontal regions. There was a strong family history of tubercle. On admission the child was seen to be suffering from deep-seated cold

abscesses in the regions above mentioned. The skin over the abscesses was unaltered. These were treated by carrying a horseshoe-shaped incision down to the bone around three-quarters of the circumference of the abscess: the flap having been turned down and the pus and caseous matter removed, the softened tubercular bone at the floor of the abscess was scraped away and the dura exposed. The adjacent bone was then snipped away all round the circumference of the opening until healthy bone was reached: the flap was then stitched back into position and no drainage employed.

The abscess in the occipital region was exactly over the junction of the lateral and longitudinal sinuses at the "Torcular Herophyli." The dura itself appeared to be quite healthy, and could be freely scraped without injuring the sinuses. The wounds, all healed by first intention, but a sinus developed at the outer extremity of the wound above the left orbit. On opening up the parts in this situation it was found that the anterior fossa of the skull and the outer wall of the orbit were extensively diseased. After this last operation the child's general health began to decline, and it died four months after admission. At the post-mortem the longitudinal sinus was found to be thrombosed, the edges of the openings in the skull were healed, and a certain amount of new bone had developed around the circumference; the dura in the region of the openings was not adherent to the arachno-pia; there were a few scattered tubercles in the left Sylvian fissure; the left middle ear was tubercular; the tegmen tympani was eroded, and there was a small amount of tubercular debris outside the dura in the middle fossa.

(*b*) HERNIAL SAC AND STRANGULATED TESTICLE removed from an infant (age 14 days) during operation for irreducible inguinal hernia.

The hernia first appeared at 11 A.M. on the day before admission; it appears to have come down during a crying fit. On the following day the bowels were moved four times as the result of a dose of grey powder, and at 5 P.M. on the same day persistent vomiting set in. When Mr Stiles saw the infant at 10 P.M. the vomiting was beginning to be fæcal. There was a very tense and somewhat tympanitic swelling in the right half of the scrotum, which was of a livid colour; the bowels had just moved. No taxis was attempted.

On cutting down and opening the sac it was found to contain a loop of small intestine, which was only slightly congested, and was returned after division of the neck of the sac and part of the anterior wall of the canal. At the fundus of the sac was the testicle, which was swollen and of a deep purple or almost black colour; the veins of the cord were greatly distended and thrombosed.

The case is of interest, from the fact that the strangulation of the testicle, which was completely descended, was in all probability brought about by the descent of the bowel, the strangulation being produced either by the direct pressure upon the veins of the cord or by its torsion. Since the bowel was merely congested, it would appear that the severe vomiting was due to the strangulation of the testicle rather than to the irreducibility of the bowel. A further interesting point about the case is the very early age of the patient.

The child made a good recovery, but died of convulsions a week after he left the hospital.

(*c*) SAC OF A HYDROCELE WITH CONSTRICTION CORRESPONDING TO EXTERNAL ABDOMINAL RING. The specimen was removed at operation from a boy aged 8 years. The sac, which was funicular in type, extended down to the bottom of the scrotum, but had no connection with the tunica vaginalis testis; it extended upwards into the inguinal canal as far as the internal abdominal ring; there was no communication with the abdomen. The constriction corresponding to the external abdominal ring was well seen. Mr Stiles' reason for showing the specimen was to point out that it was this condition which was so often mistaken for hernia. In regard to treatment, he thought excision of the sac was preferable to the injection of iodine or carbolic acid; simple tapping was almost invariably followed by recurrence.

(*d*) A darning-needle removed from the abdomen of a child aged 18 months. The child was brought to the out-patient department at the Children's Hospital with an indurated mass in the abdomen, which had been previously diagnosed as tabes mesenterica. The mass, which crossed the abdomen horizontally a little above the anterior superior iliac spines, was peculiarly rigid to the feel, and a sharp body could be felt just beneath the skin at its left extremity, but the right extremity seemed to be considerably thicker. It was deemed advisable,

therefore, to cut down upon the blunt end after first projecting the sharp end through the skin and grasping it with forceps, so that the blunt end might be pushed back into the wound.

3. *Dr Harvey Littlejohn* exhibited—

(*a*) An EXTRA-PERITONEAL RUPTURE OF THE BLADDER, which resulted from direct violence.

The man, while under the influence of drink, received a kick upon the lower part of the abdomen. He went home and was found on the following morning sitting in the water-closet and complaining of pain in the abdomen. He had passed a small quantity of bloody urine. Being Sunday he remained in bed all day, made no complaint giving rise to suspicion as to the serious nature of his injury. On Monday he walked up to the Royal Infirmary, and was admitted as an in-patient. The absence of well-marked symptoms caused some doubt as to the real nature of his condition, and he died upon Tuesday. At the post-mortem the tissues of the lower half of the abdomen were found swollen with extravasated urine. There was commencing peritonitis, and effusion of lymph in the pelvic cavity. On the anterior wall of the bladder, slightly below its middle and towards the left side, there was a rupture one and a half inches long, with irregular edges, and considerable laceration and bruising of the surrounding textures. There was no fracture of the pelvis or other injury to the body.

(*b*) A specimen showing great DILATATION OF THE PULMONARY ARTERY.

This exceedingly rare condition occurred in a woman, æt. 65, who died suddenly. She was much given to drink, and used to complain of bronchitis and shortness of breath, for which she did not take medical advice, since she was not incapacitated from doing her ordinary household duties. There was no history of any serious illness in youth, but about ten years ago she was treated in the Royal Infirmary for dropsy, according to the statement of her sister. At the post-mortem the right lung was found to be healthy and voluminous, the anterior border lying considerably beyond the middle line of the chest towards the left side.

The left thoracic cavity appeared to be entirely filled by the pericardial sac, which was freely movable and unattached by

any adhesion to the costal pleura. The left lung was present as a small, flattened, hard mass lying against the vertebral column, and attached to it by a covering of almost cartilaginous consistence.

The heart was oval in shape, the long axis being transverse and measuring 5½ inches. The measurement from the base of the aorta to the apex was 3¼ inches. The pulmonary artery, from its commencement to the line of attachment of the pericardial sac was 3 inches in length, and it was greatly dilated, measuring over 6 inches in circumference. On dissection it was found that the opening of the right pulmonary artery admitted two fingers, while the left artery formed a bulbous cavity about the size of a large walnut. The vessels passing into the left lung were apparently completely obliterated. The pulmonary valves were normal, and the orifice was not appreciably enlarged. The other cardiac valves appeared to be competent and free from disease.

The right venticle was dilated and the walls hypertrophied. There was very marked hypertrophy of the left ventricle. The aorta was dilated, and showed an advanced condition of atheroma with calcareous deposits.

In all probability the collapse of the left lung took place in childhood, and the dilatation of the pulmonary artery was due to this cause. The walls of the pulmonary artery were increased in thickness.

VI. Original Communications

1. VALEDICTORY ADDRESS

By A. Gordon Miller, M.D., F.R.C.S.Ed., President

Gentlemen,—Following the usual custom, I have the honour, as your retiring President, to address you this evening.

The feeling uppermost in my mind is one of gratitude to the Society for having honoured me by placing me in this chair.

The past two sessions have been most prosperous and successful. This has been mostly due to the wise guidance of our affairs by the Council, to the able and zealous labours

of the two Secretaries, and to the spirit infused into our work by the Treasurer.

It is said that the man who fishes every day, and in all weathers, is the most successful, as well as experienced (and therefore expert) fisherman. The same sort of thing may be said of attendance at the meetings of such a society as this. From my position—which is one that has many advantages—I can confidently say to members that regular attendance is most profitable, whether the subjects under discussion are specially attractive or not.

There is something worth while to be picked up at every meeting. It may be at the beginning, or the middle, or the end of a meeting, and it may therefore be missed by the man who only looks in casually, just as the casual fisher may miss the very hour in the day when the "take is on."

This leads me to say that our meetings have been attended, during the past two years, somewhat better than they were before. There have doubtless been several causes for this. One has been the excellence of the papers and the importance of the subjects selected by the Council for discussion. Another cause has perhaps been the refreshment provided for the early birds of the members, for which we are indebted to the sagacity of our Treasurer.

I have the satisfaction of reporting that our membership has increased considerably, the number of our ordinary members being 450. Last year no less than thirty-nine new members joined, the largest number during the last ten years.

I am very sorry to have to record a very long death list, one hon. member, Sir James Paget, Bart., two foreign corresponding members, Professor Max von Pettenkofer, of Munich, and Professor Ollier, of Lyons.

Of our ordinary members no less than twelve have left us, the venerable and respected Sir Douglas Maclagan, Dr W. H. Lowe, of Wimbledon, His Excellency Dr Robert H. Gunning, and Sir W. O. Priestly, M.P.

Dr John Henderson, of Leith, and Dr William Husband, our oldest members, have died quite recently. They did not attend our meetings of recent years, but they continued to take an. interest in the Society to the last. Much the same might be said of Deputy-Surgeon-General Fleming.

The sad death of Professor A. W. Hughes, of London, after

his return from South Africa, is not forgotten by any of us. He gave his life for his country, and no man can die more nobly.

During the last few days Dr Connel, of Peebles, has passed away from among us—a man who lived an active and useful life, and who will be greatly missed by both his patients and his friends.

Of Dr George Elder I must say a word. His kindly, cheerful, and active personality made him a pleasant member of our Society, and his ability and capability for hard and good work makes his loss deeply felt. His life was full of promise, and was cut short all too suddenly.

Quite recently we have lost from our midst a well-known face. Dr Foulis was a very regular attender of our meetings, and contributed many interesting and valuable papers. He was also a good debater, and always added zest to the discussions in which he took part. He was a hard worker and devoted student of science.

Last but not least, there rises up before me the memory of a fine, manly presence, one who attracted attention and who always had something to say that was worth hearing. To my mind, no one could demonstrate a case, bringing out the salient points, and, without wearisome detail, painting the patient in bold and easily recognised outline, like Sir Thomas Grainger Stewart. I am sure that I express the sentiment of this Society when I say that we miss Sir Thomas from our midst, and respect his memory as a great clinical teacher, and one who did much to make the meetings here both valuable and interesting.

We are to have the Treasurer's report before us to-night. All I need to say, therefore, regarding our financial position is that we are prospering. I have also the pleasure of reporting that, under the able management of the Editor, our Transactions are flourishing.

A motion by our treasurer will be brought before the Society this evening, proposing that we should hold clinical meetings in the Royal Infirmary and Sick Children's Hospital. The Council hope that this proposal will meet with the support of the members, and that their action in securing beforehand the consent of the managers will be approved.

I have now to say something regarding the work of the

past two sessions. Ninety patients were brought before us. Of these 56 were medical, and of these again about a half were suffering from nervous diseases. Thirty-four cases were surgical, and of these about a half were abdominal. I need not enter into detail. The statistical facts stated are noteworthy, and indicate where the interest of the profession seems to lie at present.

Of *pathological specimens* we have had a large number. Eighteen were brain specimens and 7 were abdominal (altogether about 70 specimens were shown).

Several instruments and apparatuses were demonstrated to the Society.

Three meetings were entirely clinical.

Of *Papers* and *Discussions* we have had 29. Ten papers and discussions were on surgical subjects, 10 were medical, 3 were on insanity, and the remainder on a variety of subjects.

Five evenings were entirely devoted to the consideration of a single subject.

I shall now select a few papers for brief remarks.

In January 1900 Dr Charles Begg read a paper on the "Treatment of Smallpox by Salol." It was short, practical, and mostly clinical. Just the kind of paper we like to have. His results were remarkable and most satisfactory.

In March 1900 we had a most interesting discussion on "Heredity," introduced by Professor Hamilton, of Aberdeen. Though there was not much new light thrown on the subject, the speeches were most interesting, vigorous, and apparently convincing. Facts were brought forward by the debaters on both sides that seemed unanswerable. But at the conclusion each speaker seemed to be "of the same opinion still." The conclusion, according to some, was too quickly arrived at. This, however, was atoned for by the Editor of the *Scottish Medical and Surgical Journal* kindly printing several speeches that were undelivered.

In June 1900 Dr Foulis, whose recent death we all deplore, gave us an eloquent and lucid demonstration of his views regarding the origin, development, and structure of the umbilical cord.

Two evenings were devoted to South Africa. Professor Chiene gave us a most interesting account of his experiences,

and Dr Francis Boyd communicated a paper on the work done by the Edinburgh Hospital.

In February 1901 we were favoured with a paper on "Gastric Hæmorrhage and its Surgical Treatment," by Mr Mayo Robson, of Leeds. The paper was clear and practical. The writer pointed out the importance of diagnosis, especially in regard to defining the position of the ulcer. He also enforced the necessity for the surgeon seeing the case early, and not being sent for at the last moment—an early operation being essential.

A most interesting and practical discussion followed, during which Dr James contributed his experience in regard to 50 cases that had occurred in his wards, in 46 of which there had been hæmatemesis, with no death. Dr Byrom Bramwell also stated that he had had no deaths.

In March 1901 Dr Edwin Bramwell read a most valuable and interesting paper on "Myasthenia Gravis."

In May Dr William Russell expounded his views regarding Arterial Hypertonus, with a lantern demonstration of preparations and pulse tracings. He drew a distinction between atheroma and arterio-sclerosis, disputing and controverting Thoma's views.

At the next meeting we had two remarkable papers from Drs Lewis C. Bruce and Ford Robertson on "General Paralysis." In the discussion which followed, most of the speakers seemed to consider that these papers established a new departure, and overturned the old accepted doctrines regarding the pathology of this disease, the writers holding that the disease is of toxic origin, and is vascular rather than nervous in regard to its pathology.

The last meeting was held in July 1901, when a paper was read by Professor Woodhead, of Cambridge, on "Alcohol," which was followed by a long and interesting discussion.

I shall not attempt to give an account of this discussion. It has been fully reported—especially in the *Scottish Medical and Surgical Journal*—and will appear in our Transactions, where any member may study the speeches for himself.[1]

[1] The most complete report of Prof. Woodhead's paper is in the *British Medical Temperance Review* for October 1901.

I should like, however, before closing this address, to give the Society the impressions which the debate produced on my mind.

It was evident that the speakers were divided into two camps, and they seemed to me not to fully understand one another. On the one side there was a tendency to speak of the evil results of alcohol as if they were always due to large doses, to confuse social consumption with medicinal administration, and moderation with excess. On the other side there was a tendency to forget that frequent small doses may be even more harmful than large ones, and that single small doses, which are supposed to be harmless, are practically never administered or taken.

The subject is a very far-reaching one, and of immense importance medically, socially, morally, and religiously. I shall not attempt to grapple with it, but will conclude by stating briefly my own views as to the duties of medical men in the matter.

What, in my opinion, is wanted, in the present day, is the education of the people in regard to the danger of alcoholic indulgence.

It is not sufficiently understood that alcohol causes fatty and fibrous degeneration, not only of the liver, but of other organs also. That it injures the blood-vessels and the heart, but especially the nerve centres. That it produces degenerations transmissible to offspring, and that it shortens life as shown by insurance statistics.

I am sure that we all know of persons who have materially shortened their lives by habitually taking alcoholics in quantities which may never have produced any marked evidence of intoxication. We also know that many pathological changes, in the vascular and nervous systems, that were previously considered and called "senile," are distinctly and admittedly due to alcohol.

The evils of drunkenness are well known, and we do not need to draw special attention to them; but it is not so generally understood that comparatively small quantities of alcoholic beverages, frequently taken, may be quite as injurious to the tissues. In other words, that *frequency* is as dangerous as *quantity* from the pathological point of view.

Some people will continue, I am afraid, to misuse alcoholic

beverages whatever we say. But is it not our duty at least to warn them of the danger which they incur?

2. A CONTRIBUTION TO THE LOCALISATION OF THE MOTOR NUCLEI IN THE SPINAL CORD OF MAN

By ALEXANDER BRUCE, M.A., M.D., F.R.C.P.Ed., F.R.S.E., Assistant Physician to the Edinburgh Royal Infirmary; Lecturer on Practice of Physic, Surgeons' Hall

IT is gradually being recognised that the motor cells in the anterior cornua of the spinal cord are arranged, not in a haphazard, irregular fashion, but in certain definite groups, which are more or less constant for each segment. Up to the present time, however, those who have devoted attention to the subject are not agreed as to the distribution of these groups. This want of harmony is in part due to the difficulty, which is by no means inconsiderable, especially with regard to the lumbo-sacral region, of enumerating the segments; and in part to the want of systematic examination of the arrangement of the cell groups themselves within each segment. As the result of such an examination I have described and figured[1] the following main groups in the lumbo-sacral region :—

A. A *mesial* group, which is capable of further sub-division into an anterior and a posterior part.
B. An *antero-lateral* group.
C. A *postero-lateral* group.
D. A *post-postero-lateral* group.
E. A *central* group.

In addition to these there are other groups of cells—an intermedio-lateral, and a group internal to the antero-lateral, which Onuf has designated by the letter X. As it is probable from their character that these do not innervate striped muscle, they will not be further referred to in this communication, nor will a small group found in the second lumbar segment immediately lateral to the mesial group, which I have termed the anterior group.

[1] "Topographical Atlas of the Spinal Cord."

The *mesial* group extends from the first to the fourth lumbar segment, then, except for the presence of an occasional cell, is unrepresented in the fifth lumbar, first and second sacral. It reappears in the third sacral segment and is continued to the lower limit of the fourth, where it ceases entirely (Fig. 1, *m.*).

The *antero-lateral* group appears at the second lumbar segment as a small collection of cells at the corresponding angle of the cornu. It gradually increases in size until it forms a large and important group, which, here and there, indicates a tendency to further sub-division. Throughout the first and second sacral segments it diminishes somewhat rapidly and cannot be traced below the second sacral (Fig. 1, *a. l.*).

The *postero-lateral* group extends from the second lumbar to the lower limit of the third sacral, and attains its maximum development at the fourth and fifth lumbar segments (Fig. 1, *p. l.*).

The *post-postero-lateral* group, as it has been termed by Onuf, is situated immediately dorsal to the preceding one, and extends

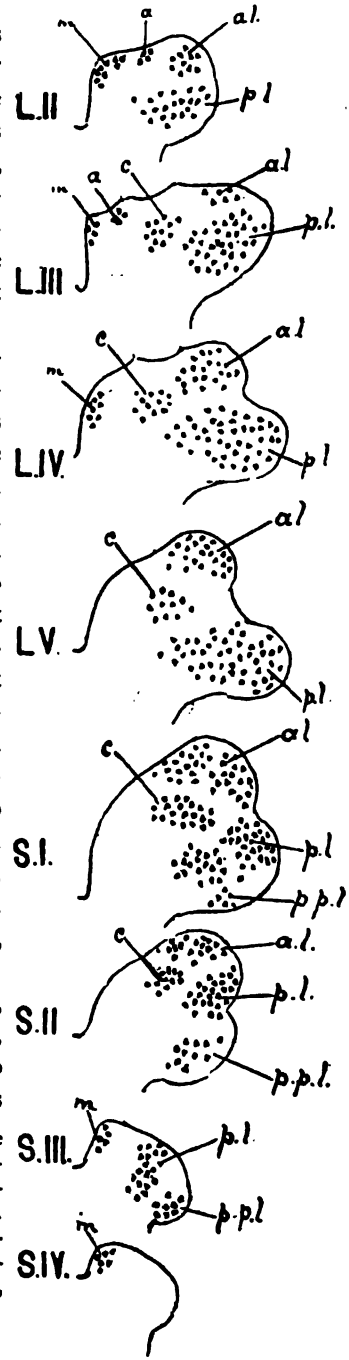


FIG. 1.—Diagram of the cell-groups in the spinal segments from L. 2 to S. 4 inclusive (reduced from the writer's "Topographical Atlas of the Spinal Cord"). *a. l.*, antero-lateral group; *p. l.*, postero-lateral group; *p. p. l.*, post-postero-lateral group; *c.*, central group; *m.*, mesial group; *a.*, anterior group.

from the first to the lower extremity of the third sacral segments, reaching its greatest size in the second and upper part of the third sacral (Fig. 1, *p. p. l.*).

The *central* group lies internal to and between the two main lateral groups. It extends from the second lumbar to the second sacral segments (Fig. 1, *c.*).

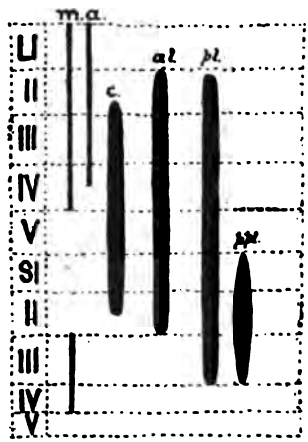


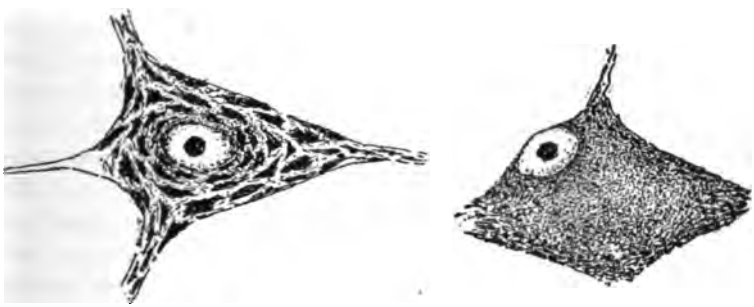
FIG. 2.—Scheme to show the longitudinal distribution of the cell-groups in the lumbo-sacral region of the cord. The letters have the same significance as in Fig. 1.

The longitudinal extent of these various groups will be more readily followed from the annexed figure (Fig. 2).

The constancy of the distribution of these groups of motor cells in the anterior cornu naturally suggests that each group has a definite function—in other words, is the spinal centre for definite muscles; but, until the discovery by Nissl of the change which occurs in the motor cells after section of the nerves which arise from them, no sufficiently exact method was available for the determination of the localisation of these centres. Nissl has shown that, when a nerve fibre is divided, the cell from which it arises undergoes certain characteristic changes, viz., the chromatic elements become gradually replaced by a finely granular, almost homogeneous material, which stains faintly with aniline dyes, and is diffused throughout the whole cell. This change affects the dendrites as well as the body of the cell, so that they stain feebly; and in consequence the cell, when viewed under low powers of the microscope at least, seems to have more or less completely lost its angular character, and to be denuded of its processes. The nucleus of the cell leaves its central position and tends to project at one side of the cell. The faintness of the staining, the rounded outline, and the eccentric position of the nucleus of the affected cell are in such decided contrast to the deeply-stained "tigroid" appearance of the normal cell, with its pointed angles, well-marked dendrites, and central nucleus, that the identification of the cells which show the *réaction*

à distance, as Marinesco has termed it, is a very simple matter (Fig. 3).

This method of investigation may be used in two ways for the determination of the motor localisation in the cord. On the one hand, a nerve may be divided, or, what comes to the same thing, a muscle removed, and the position of the cells which show the *réaction à distance* ascertained. On the other hand, after an extensive removal of the muscles of a limb, a small group of muscles may be left attached to their motor nerves, and the position of the unaffected anterior



A B

FIG. 3.—(A) Normal cell of anterior cornu. (B) Cell showing *réaction à distance* with eccentric nucleus and finely granular protoplasm.

cornual cells established. These normal cells accordingly represent the motor centres of the muscles which have not been removed.

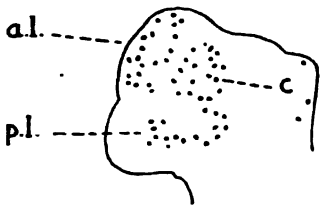
Such experiments can easily be carried out in animals, but in the human subject observations can only be made in those comparatively rare cases where death has occurred within the necessary limits of time—not sooner than fourteen days and not later than four months after the removal of a limb or part of a limb. Two such cases I have recently had an opportunity of examining, through the kindness of my friends Mr Stiles and Dr Shennan, the surgeon and pathologist, respectively, of the Royal Hospital for Sick Children. In one instance the thigh had been amputated at its lower third, *i.e.* below the level at which its muscles receive their nerve supply. In this case, therefore, the only cells to undergo the *réaction à distance* would be those which innervate the muscles of the leg and foot. In the second case, a most extensive operation was

performed for tubercular disease of the hip-joint and ilium, the whole of the lower limb with the acetabulum and ilium, and (at a subsequent operation for a sinus) the spine of the ischium being removed. From a careful consideration of the steps of the operation by Mr Stiles, I am convinced that the only muscles of the lower limb which were not taken away, or were not cut off from their nerve supply, were the *psoas-iliacus* and *pectineus*, the *obturator internus*, the *pyriformis* and *gemelli*. The pudic nerve was undoubtedly injured in the removal of the ischial spine, but whether in whole or in part I am not in a position to determine with certainty.

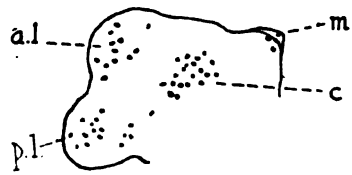
In the first case (Plate V.), that of amputation above the knee, the motor cells in the first four lumbar segments were found to be perfectly normal (Pl. V. Fig. 1, L. 4). In *the fifth lumbar segment, at its upper part*, some cells in the *postero-lateral group* showed the Nissl reaction. *In the lower part of the fifth lumbar segment* (L. 5) *the whole of the postero-lateral group was affected, while the antero-lateral, central, and mesial groups were found to be perfectly intact. In the sacral segments the antero-lateral, central, and mesial groups were normal, the reaction being confined to the postero-lateral and post-postero-lateral groups* (Fig. 4, E). The maximum reaction was found at the first sacral segment (S. 1), at which level the postero-lateral group is very large, and the post-postero-lateral begins to appear. In the third sacral segment (S. 3) the whole of the lateral group of cells in the anterior cornu was affected (no doubt because, as explained in my Atlas, the antero-lateral and central groups do not extend so low down); but the whole of the cells of the mesial group in this, as also in the fourth segment (S. 4), were perfectly normal.

In this case, therefore, the *centres for the muscles of the calf and those supplying the foot were situated in that part of the postero-lateral column of cells which lies between the upper limit of the fifth lumbar segment and its lower termination in the third sacral segment; and also in the post-postero-lateral group throughout its entire extent.* This result is in exact agreement with that found by Van Gehuchten and De Buck (Fig. 4, B) in two cases of amputation of the lower part of the thigh, so that these columns of cells may be regarded

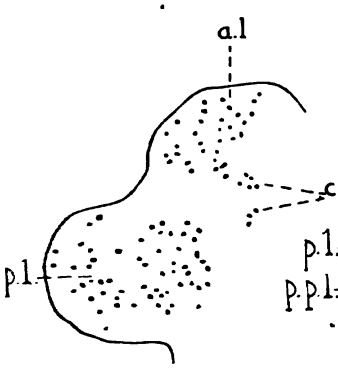
PLATE V.



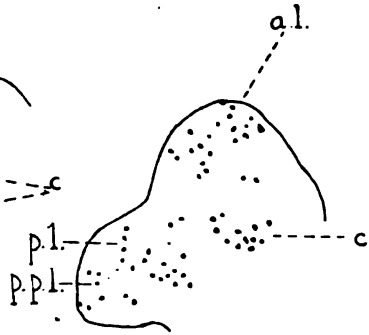
L.4.



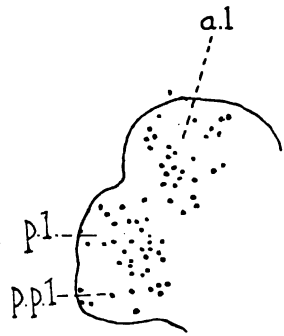
L.5. (lower)



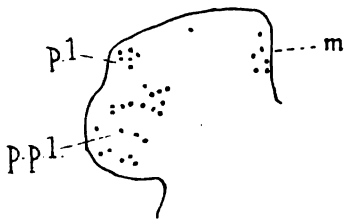
S.1.



S.2. (upper)



S.2. (lower)



S.3

S.4.

Normal Cells—black. Degenerate Cells—red.

TO ILLUSTRATE DR BRUCE'S PAPER.

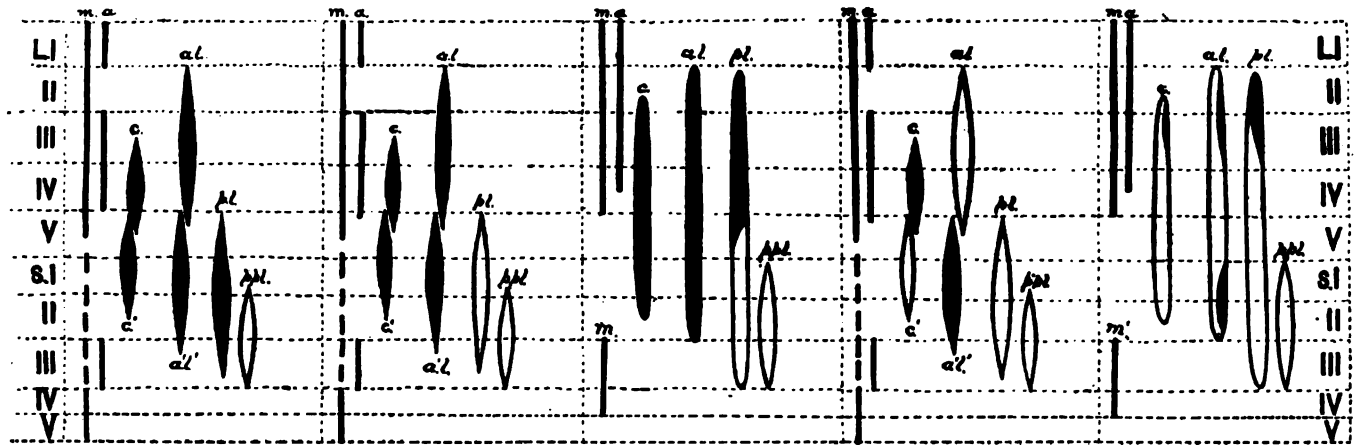
as the centres for the muscles of the calf and those of the foot.[1]

Van Gehuchten and Nelis have shown (Fig. 4, A) that in a case of *amputation at the ankle* the *réaction à distance* was limited to the *post-postero-lateral group*, or, as the former terms it, the *secondary postero-lateral group*. If this is confirmed by subsequent examination, we may regard the post-postero-lateral column from S. 1 to S. 3 as the *centre for the intrinsic muscles of the foot*, and the *postero-lateral group from the fifth lumbar to the upper part of the third sacral segment inclusive* as the *centre for the muscles of the calf, and* what may be termed *the extrinsic muscles of the foot, i.e.* those which arise from the tibia and fibula. The exact lower limit is in all probability somewhat different in different cases.

In the second case which I examined, as already said, all the muscles of the lower limb were removed, with the exception of the psoas-iliacus, pectineus, the obturator internus, pyriformis, and gemelli. In addition, all the muscles supplied by the pudic nerve were probably cut off from connection with their motor centres. (It is to be remembered that the nerves to the coccygeus muscle and to the posterior part of the levator and sphincter ani arise from the fourth sacral root independently of the pudic nerve.) It was to be expected, therefore, in such a case, that the only motor cells in the lumbo-sacral region left intact would be those for the psoas-iliacus, the obturator internus, the pyriformis and gemelli, and the coccygeus and the posterior part of the levator and sphincter ani. It was found in this case that the amount of the *réaction à distance* was much more extensive than in the first case, and that, with certain exceptions which will now be described, it affected the whole of the

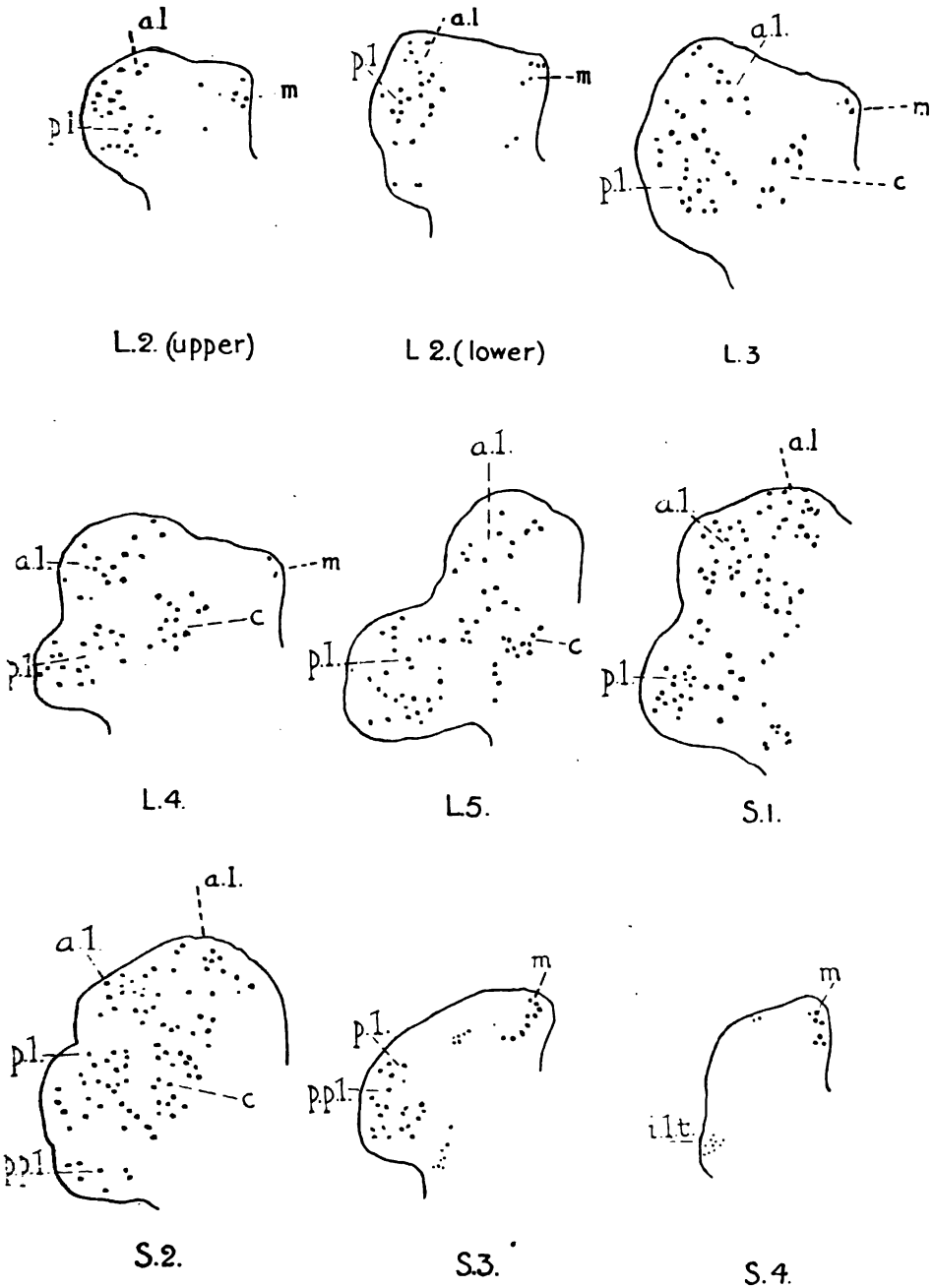
[1] There is this difference between Van Gehuchten and myself, that whereas he does not trace the postero-lateral column higher than the fifth lumbar (see Fig. 4, A, B, D), in my opinion it extends to the upper limit of the second lumbar segment, and therefore that part of it which is situated in the second, third, and fourth lumbar segments must innervate muscles higher than those of the leg. According to Van Gehuchten the postero-lateral cell column, as he describes it, is entirely devoted to the innervation of the muscles below the knee. It is to be noted, however, that we are in entire agreement as to the position of these spinal leg centres, and at aria nce merely as to the longitudinal extent of the postero-lateral column.

FIG. 4.—Scheme to show longitudinal extent of *réaction à distance* after amputation at various levels. Healthy areas black, degenerated areas merely outlined.



A	B	C	D	E
At ankle. (Van Gehuchten and Nelis.)	At knee. (Van Gehuchten and De Buck.)	At knee. (Bruce and Stiles.)	At hip. (Van Gehuchten.)	At hip, with removal of ilium. (Bruce and Stiles.)

PLATE VI.



Normal Cells—black. Degenerate Cells—red.

TO ILLUSTRATE DR BRUCE'S PAPER.

cell columns in the lumbo-sacral region below the first lumbar segment, which was normal.

In the upper part of the second lumbar segment (Plate VI., L. 2, upper) some cells in the posterior part of antero-lateral group were affected, while the remainder of the antero-lateral, the whole of the postero-lateral and mesial groups were normal. In the lower half of the segment (L. 2, lower) degenerated cells were found in increasing numbers in the antero-lateral and postero-lateral groups, but were still considerably outnumbered by the normal cells.

In the third lumbar segment (L. 3) normal cells were still present in both of the lateral groups, but their number rapidly diminished as the lower limit of the segment was approached, while, on the other hand, the degenerated cells became very numerous. In the central group several of the cells were normal. The mesial group was entirely normal.

In the fourth lumbar segment (L. 4) the cells were practically all degenerated in both of the lateral groups, and in the central group. The mesial group, however, remained normal.

Of the fifth lumbar segment (L. 5) the same may be said. The lateral and central groups were degenerated; the mesial remained healthy.

In the first sacral segment (S. 1) normal cells again appeared, and gradually increased throughout the antero-lateral group until they formed a considerable proportion of its cells in the lower part of the segment. An occasional normal cell was found in the central group, but the postero-lateral was entirely degenerated.

In the second sacral segment (S. 2) a large proportion of the cells in the anterior part of the antero-lateral group remained normal, and an occasional normal cell was found in the central group. The hinder portion of the antero-lateral, the postero-lateral, and the post-postero-lateral groups were affected throughout.

In the third sacral segment (S. 3) there were no normal cells in the remaining portion of the lateral groups (viz., the postero-lateral and post-postero-lateral). The mesial group, which had reappeared, contained a few healthy cells, but the majority had undergone the Nissl reaction.

In the fourth sacral segment (S. 4) the mesial group, which

alone persisted, was almost entirely degenerated, but the proportion of normal cells was considerably greater than in the preceding segment.[1]

To sum up the results of the examination of this second case, we have seen that there were unaltered cells in three separate positions in the lumbo-sacral cord—(1) within the second and third lumbar segment in the antero-lateral and to a less extent in the postero-lateral and central groups; (2) within the first and second sacral segments in the ventral part of the antero-lateral group; (3) within the third and fourth sacral segments in the mesial group of cells.

The distribution of the affected cells is shown in Fig. 4, E, where the portions of the antero-lateral groups remaining unaltered have been represented black. The lower mesial group (m^1) in the third and fourth sacral segments, although affected, has been left black.

We have also learned that in the removal of the limb the following muscles were left in connection with their nerve centres—(1) the psoas-iliacus and pectineus; (2) the obturator internus, pyriformis and gemelli; (3) the coccygeus and the posterior parts of the levator and sphincter ani.

The anatomical distribution of the nerves in the lumbo-sacral region indicates that the psoas-iliacus and pectineus are innervated from the second and third lumbar segments chiefly; the obturator internus is innervated from the first and second sacral segments; and the pyriformis from the second sacral. It seems therefore clear (1) that the psoas-iliacus and pectineus have their centre in the unaffected cells in the antero-lateral, postero-lateral and central groups of the second and third lumbar segments; (2) that the centres for the obturator internus, pyriformis and gemelli are situated in the ventral portion of the antero-lateral group in the first and second sacral segments.

The mesial group in the third and fourth sacral was partly normal and partly degenerated. The explanation of this is not so clear as that of the conditions already described. It seems practically certain that the pudic nerve had been injured in its course round the spine of the ischium, and that the perineal muscles (with the exception of the posterior portions

[1] Nissl's reaction was found in the cells of the intermedio-lateral group. These, therefore, probably supply some organ through the internal pudic nerve.

of the levator and sphincter ani, and of the coccygeus muscle which receive their nerve supply directly from the fourth sacral nerve within the pelvis), had thus become disconnected from their nerve centres. Hence the mesial group of the third and fourth sacral segments was partly affected and partly normal—a double proof of its connection with the perineum (urethra and anus). In further support of this is the escape of this group of nerve cells in case 1 (Fig. 1, S. 3 and S. 4), where in S. 3 the whole of the postero-lateral and post-postero-lateral groups were degenerated.

The examination of these two cases has established the centre for the psoas-iliacus and pectineus, the obturator internus, pyriformis and gemelli; the muscles of the leg and foot; and lastly, for the muscles supplied by the internal pudic nerve.

With regard to the localisation of the other lumbo-sacral centres, much information may be gained by contrasting the results just described with those obtained by Van Gehuchten, Nelis, De Buck, Sano, etc.

As already stated, the intrinsic muscles of the foot have their centres in the post-postero-lateral groups of the first, second, and third sacral segments, especially in the second. The centres for calf and extrinsic foot muscles occupy the whole of that part of the postero-lateral group which lies below the fourth lumbar segment, namely, in L. 5, S. 1, S. 2, and upper part of S. 3. The remaining muscles of the lower extremity must have their centres in the remaining groups of cells of the lumbo-sacral region, namely, in the postero-lateral group above the fifth lumbar (considered by Van Gehuchten to be part of the antero-lateral group), the antero-lateral and central groups.

A case of Van Gehuchten's of amputation of the thigh throws much light on the distribution of the centres, especially when considered along with the known origin of the lumbo-sacral plexus. He found in addition to the changes in the post-postero-lateral, and postero-lateral groups, which were manifestly due to the removal of the leg and foot, that Nissl's reaction was present in the central group in L. 5, S. 1 and S. 2, and in his antero-lateral group (which includes my postero-lateral group) in L. 2, L. 3, and L. 4; and that, on the other hand, the upper central group in L. 2, L. 3, and L. 4, and the lower antero-

lateral in L. 5, S. 1, and S. 2, were intact. I have endeavoured to indicate the positions of the degenerated and the normal groups of cells in Fig. 4, D.

These affected groups of cells, which show Nissl's reaction, must obviously form the nuclei of origin of the muscles of the thigh, which have been removed by the operation, namely, the hamstrings, the extensors of the knee, the adductors and sartorius. The hamstrings, as we know, are innervated by the great sciatic nerve, which again is formed by roots derived from L. 5, S. 1, S. 2 and S. 3. These, with the exception of the last, are the very segments in which the central group of cells shows the Nissl reaction. The inference seems obvious that this part of the central group must contain the nuclei of origin of the hamstring muscles.

The remaining muscles, namely, the adductors, quadriceps, sartorius, and tensor fasciæ femoris, must, if the above reasoning hold good, arise from the upper part of the antero-lateral group (using the term in Van Gehuchten's sense).

There is no direct evidence as yet to show whether the quadriceps lies in front of, or behind, the adductor group, although the remarkable leash of sensory fibres which passes at the level of L. 3 and L. 4, directly forwards towards the antero-lateral group of cells, and which is supposed, with much reason, to be part of the nervous arc involved in the knee-jerk, would seem to indicate that this antero-lateral group was the centre for the quadriceps. In this case the adductor centre would lie in the postero-lateral group. But for the determination of these points further evidence must be obtained.

If we turn now to the muscles which have not been removed, and to the centres which have been left intact, we find that the former consist of the psoas-iliacus and pectineus, the external rotators of the hips, namely the gluteus maximus, obturator internus, gemelli, pyriformis, and quadratus femoris, in addition to the gluteus medius and minimus and the obturator externus.

My positive conclusions with regard to the psoas-iliacus, supported by the anatomical evidence as to its roots, show that its centres must lie in the second and third lumbar segments in the antero-lateral and postero-lateral groups of cells, and that consequently the view of Van Gehuchten, which places them in the lower antero-lateral column from L. 3 to S. 5, with which

segments their nerve-roots are in no way connected, is erroneous. My second case has also proved that the centres for the obturator internus, pyriformis, and probably gemelli, are situated in the anterior portion of the antero-lateral group in S. 1 and S. 2, a fact which is in direct harmony with the established origin of their nerve roots. It may be considered as reasonably probable therefore that the gluteus maximus also, which is itself an external rotator and which derives the main portion of its roots from L. 5, S. 1 and S. 2 has its centre in the remaining portion of the antero-lateral group at these levels. In my case, the gluteus maximus was certainly removed, and this portion of the nucleus had undergone the Nissl's reaction. In Van Gehuchten's case, the gluteus maximus was certainly spared as well as the whole of the external rotators. In it the whole of the lower antero-lateral groups was intact. The upper central group including L. 2, L. 3 and L. 4 remains therefore for the gluteus medius and minimus and obturator externus. With regard to the last mentioned, the obturator externus, this localisation is in exact conformity with the known origin of its roots. With regard to the two remaining glutei, however, the roots assigned to these are stated to arise from L. 4, L. 5 and S. 1, which, if correct, would require their centres to be placed rather in the lower antero-lateral than in the upper central group.

Turning now to the mesial group of cells in the third and fourth sacral segments, we found that it was partly, but not entirely, degenerated. The degeneration was evidently related to the interference with the pudic nerve, and is an indication that the centres for the striped muscles which this nerve supplies are situated in this group of cells. The escape of some of the cells may be due to the fact that the posterior parts of the levator and sphincter ani are supplied by nerves arising from the fourth sacral segment independently of the pudic nerve; but I am not in a position to state definitely that the pudic nerve was entirely destroyed in the operation, and therefore cannot affirm that the normal condition of these mesial cells may not have been due to the escape of some of the fibres of the pudic nerve.

Van Gehuchten has placed the centres for the perinæum in the mesial group (its antero-external division) in L. 3 and L. 4, and that for the levator ani in the upper central group opposite

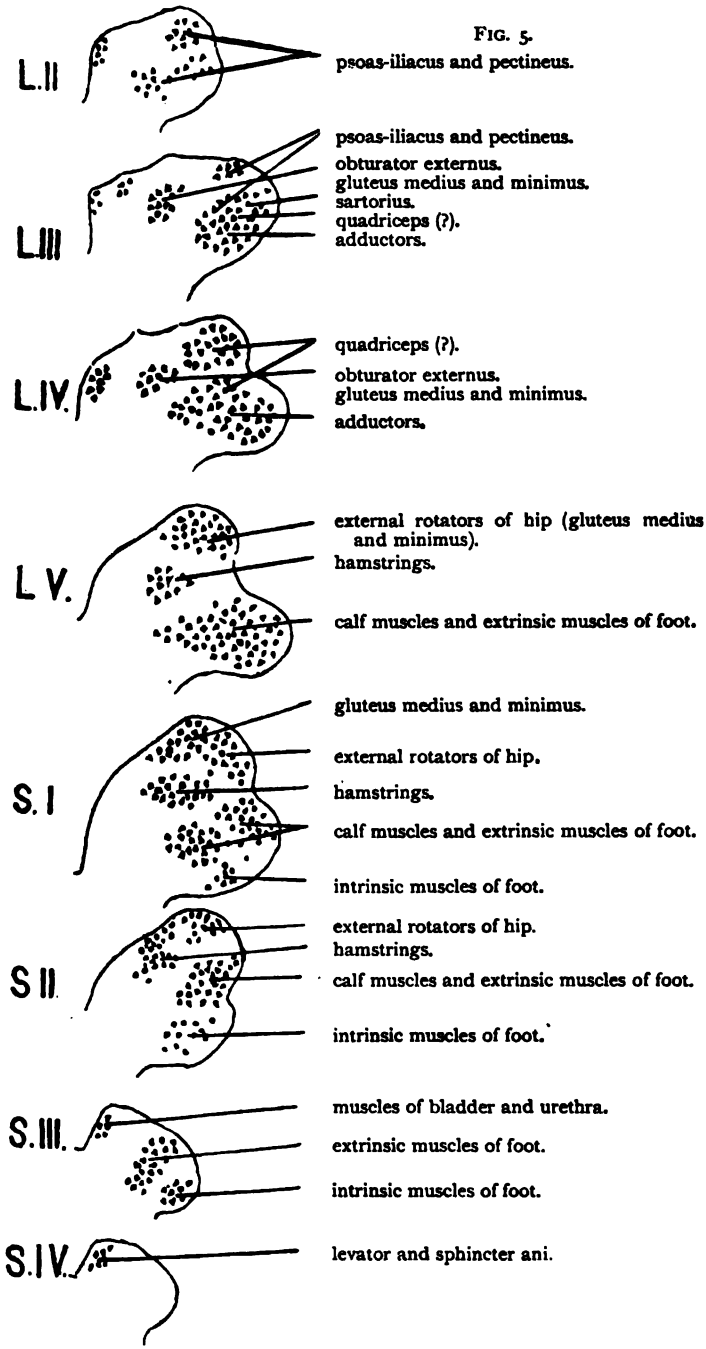

L.II
psoas-iliacus and pectineus.
L.III
psoas-iliacus and pectineus.
obturator externus.
gluteus medius and minimus.
sartorius.
quadriceps (?).
adductors.
L.IV.
quadriceps (?).
obturator externus.
gluteus medius and minimus.
adductors.
L V.
external rotators of hip (gluteus medius and minimus).
hamstrings.
calf muscles and extrinsic muscles of foot.
S. I
gluteus medius and minimus.
external rotators of hip.
hamstrings.
calf muscles and extrinsic muscles of foot.
intrinsic muscles of foot.
S II.
external rotators of hip.
hamstrings.
calf muscles and extrinsic muscles of foot.
intrinsic muscles of foot.
S.III.
muscles of bladder and urethra.
extrinsic muscles of foot.
intrinsic muscles of foot.
S.IV.
levator and sphincter ani.

FIG. 5.

	Kocher	Thorburn	Ferrier	Bruce
L. I.	—	—	—	—
II.	—	—	—	Psoas-iliacus
III.	Psoas-iliacus (pectineus) Sartorius Adductors — —	Psoas-iliacus Sartorius Adductors — —	Psoas-iliacus Sartorius Adductors Extensor cruris —	Psoas-iliacus Sartorius Adductors Extensor cruris Obturator externus
IV.	Extensor cruris (Gracilis) — Glut. med. and min. (Tens. fasc. fem.) Obt. ext. ? — —	Extensor cruris — Abductors of thigh — Extensors of hip —	Extensor cruris Adductors — — — Peroneus longus	Extensor cruris Adductors Glut. med. and min. — — —
V.	Hamstrings — — Tensor fasc. fem. Glut. med. and min.	Hamstrings — — — —	Hamstrings External rotators of hip {Leg muscles {Long flexors and extensors of toes Peronei —	Hamstrings External rotators of hip {Calf muscles {Extrinsic foot muscles — —
S. I.	— — — {Long extensors of foot and toes {Peronei brev. and long. External rotators of hip (pyriformis) Glut. max.	— — Calf muscles Peronei — — —	Hamstrings — {Calf muscles {Flex. long hallucis — Intrinsic foot muscles — —	Hamstrings External rotators of hip {Calf muscles {Extrinsic foot muscles — Intrinsic foot muscles — —
II.	— — Calf muscles Long flexors of foot and toes Intrinsic muscles of foot	— — Extensors of ankle — Intrinsic muscles of foot	— — — — Intrinsic muscles of foot	Hamstrings External rotators of hip Calf muscles Extrinsic muscles of foot Intrinsic muscles of foot
III.	— —	— —	— —	{Calf muscles {Extrinsic muscles of foot Intrinsic muscles of foot
IV.	—	—	—	—
V.	—	—	—	—

the third and fourth lumbar; a view which is not supported anatomically otherwise, and is based upon what I believe to be the erroneous view of Kaiser and Sano, that the mesial group is destined only for the supply of muscles in relation to the neural tube.

It ought also to be mentioned that not a single degenerated cell was found on the opposite half of the affected cord, every section having been carefully scrutinised to determine this point.

In the accompanying diagram (Fig. 5), I have endeavoured to show the relation of the various centres to the muscles of the lower extremity, in so far as has been definitely ascertained or may reasonably be considered probable. In several respects it must be admitted that the confirmation of future observations is still required.

In comparing this localisation with that obtained by Ferrier on experimental grounds, and by Thorburn and Kocher from the examination and comparison of clinical cases, it will be seen that the correspondence of my results with those of Ferrier is remarkably close, the only essential difference being that Ferrier finds no motor centre in the third sacral segment, and in the second one only, for the intrinsic muscles of the foot; while my scheme, which is in agreement with most of Van Gehuchten's results, shows centres for the leg and foot in the third sacral as well as in the second, in the latter of which there appears to be also a centre for the hamstrings. A table showing the various schemes referred to is appended for the sake of comparison.

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Meeting II.—December 4th, 1901

PROFESSOR T. R. FRASER, M.D., LL.D., *President, in the Chair*

I. ELECTION OF MEMBERS

The following were elected Ordinary Members of the Society:—Alex. Goodall, M.D., F.R.C.P.Ed., 48 Fountainhall Road; David W. Maclagan, M.B., Ch.B., 91 Comely Bank Avenue; W. B. MacTier, M.B., C.M., 7 Queen's Gardens, St Andrews; Geo. J. R. Carruthers, M.B., Ch.B., 4A Melville Street.

II. EXHIBITION OF PATIENTS

1. *Dr William Elder* and *Mr Alexander Miles* exhibited a patient after REMOVAL OF A TUMOUR FROM THE LEFT PREFRONTAL LOBE. A full report of the case is contained in the paper by Dr Elder and Mr Miles (p. 81).

2. *Drs Lovell Gulland* and *Logan Turner* exhibited a patient after operative treatment for LARYNGEAL TUBERCULOSIS. Mrs B., æt. 39, married, consulted Dr Gulland on May 2nd, 1901. At that date, the right lung showed apical dulness, fairly numerous crepitations and a patch of bronchial breathing. At the apex of the left lung there was very slight impairment of the percussion note. The sputum contained tubercle bacilli. The patient weighed 7 st. 8 lbs.

The patient complained of hoarseness of six months' duration: on the right side of the larynx there was a large pink fleshy mass occupying the region of the right false and true cords, and destroying the normal anatomical appearance of these structures. The rest of the larynx was normal.

During the month of May this mass was removed by Dr Turner by means of laryngeal forceps; six sittings were required and, after each removal, strong lactic acid was applied to the part. General treatment was at the same time carried out.

The patient's present condition (December 1st, 1901) is as follows: Weight, 8 st. 6 lbs.; the crepitations and bronchial breathing have disappeared and there is less dulness. The

voice has assumed an almost normal tone; in the larynx, only a slight thickening of the right true cord remains, apparently cicatricial in character; the movements of the cords on both sides are natural.

3. *Mr Shaw M'Laren* exhibited a patient who recovered from a COMPOUND DEPRESSED FRACTURE OF THE SKULL, followed by LEPTO-MENINGITIS. The patient was a middle-aged man, who, two years ago, was thrown from a phaeton against a stone wall, and sustained the fracture as above. He did not lose consciousness, but was very excitable from the moment of the injury. The skull was trephined and the comminuted fragments were removed. Careful measures were taken to sterilize the wound. The patient next day was highly delirious. On the fourth day he exhibited symptoms of septic meningitis; the temperature approached 101 degrees, and twitchings occurred in the lower limb of the opposite side, corresponding to the brain area involved. Mr M'Laren accordingly opened up the wound, washed it out, including the torn meninges and protruding brain tissue *with* 1 *in* 20 *carbolic acid solution*, and lightly packed it. The next day the temperature rose a degree and complete sensory and motor paralysis of the limb supervened. On the following day, however, improvement began, and the patient eventually recovered completely. Mr M'Laren had never before seen such a strong antiseptic applied to the brain and meninges. He would like to consider the cure of the meningitis as due to the treatment; but whether it was or not, recovery from a septic lepto-meningitis was sufficiently remarkable to justify the exhibition of the patient to the Society.

III. Exhibition of Pathological Specimens

1. *Dr William Elder* and *Mr Alexander Miles* exhibited A SYPHILITIC TUMOUR REMOVED FROM THE PREFRONTAL LOBE of a man aged 47. The case is described in their paper on p. 81.

2. *Dr F. D. Boyd, C.M.G.*, exhibited the bowel from a case of dysentery showing the characteristic lesions of the epidemic form. There were no amœbæ found in the bowel contents.

The disease was acquired in East Lothian. The patient died of hæmorrhage and exhaustion.

3. *Dr T. Burn Murdoch* exhibited two large GALL STONES from patient, aged 76, who died of malignant disease of bladder.

One weighed 4 drachms 37 grains, the other 2 drachms 3 grains. Conjoint length $2\frac{1}{2}$ inches, diameter $1\frac{1}{16}$ inches. Sausage-shaped, and beautifully jointed like a snake's vertebræ. During life no symptoms attributable to the gall bladder had been present. On enquiry after section a history of definite attacks of abdominal pain occurring at long intervals was elicited.

4. *Mr Alexis Thomson* exhibited a large GALL STONE which had caused acute intestinal obstruction, and was removed by enterotomy. The patient was a married woman, æt. 63, and had suffered from irreducible femoral hernia for over twenty years. In May 1901 she had an attack of gall stone colic, followed by slight jaundice. On 1st November 1901 she was seized with symptoms of acute intestinal obstruction. Two days later the hernia was explored by operation, and found to contain only adherent omentum. The belly was then opened in the middle line, and the fingers at once felt the large gall stone inside a coil of intestine, which was believed to be high up in the jejunum. The bowel was incised, the stone removed, the opening in intestine and in belly wall closed by sutures. The bowels moved two days later, and the patient made an excellent recovery.

The stone weighs 21 grammes, is cylindrical in shape, 4·5 cm. in length and 2·7 cm. in diameter.

5. *Dr Harvey Littlejohn* exhibited—

(*a*) INSTRUMENTS FROM N. NIGERIA—(1) "Cupping" horns; (2) lancet; (3) "Volkmann's" spoon; (4) curette, tongue scraper; (5) tweezers, etc.; (6) razor; (7) whetstone; (8) "knuckle-duster."

(*b*) CYSTIC KIDNEY AND DILATATION OF URETER, produced by accidental ligature of the ureter during operation for removal of intraligamentous ovarian cyst. The patient died suddenly eight months after the operation.

The other kidney was normal.

(*c*) SKULL CAP of man who fell from a height of 25 feet, showing localised depressed fracture of the vertex; also his CŒCUM showing rupture of the peritoneum, and of one of the longitudinal muscular bands.

These were the only apparent injuries present.

6. *Mr Charles W. Cathcart* exhibited—

(*a*) TOY WHISTLE, removed on October 22, 1901, from the trachea of a boy, aged 9, after being six weeks in the air passages. Only symptoms were slight general bronchitis; rather noisy breathing, sometimes accompanied by roughness on palpation over right apex; occasional attacks of dyspnœa of asthmatic character. Patient went home quite well, and the wound closed a fortnight after the operation of tracheotomy.

(*b*) PORTIONS OF NEEDLE AND THREAD, also Röntgen Ray photograph of the same, removed from knee of a girl, aged 7, October 1900. The child had knelt on the needle sticking in her dress, and declared that she had pulled it out by the thread and thrown it away.

When seen in consultation, the knee-joint had become septic. The deeper part of the needle and the thread were imbedded in the cartilaginous inner condyle; it had entered eye first.

The ligamentum patellæ was divided to facilitate the search for the needle, the broken end of which was recognised at last as a black speck on the surface of the cartilage. The patient recovered with a freely movable joint.

7. *Mr F. M. Caird* exhibited—

(*a*). Preparations illustrating pulmonary tubercle made by Buchhold of Munich.

(*b*) Preparations from a case of successful resection and primary suture for carcinoma of the ascending colon.

It was found necessary to remove 2 feet of Ileum, the Cœcum, ascending and part of the transverse Colon, because of extensive adhesions and the implication of lymphatic glands.

IV. EXHIBITION OF INSTRUMENTS

1. *Mr David Wallace, C.M.G.*, exhibited Beckmann's apparatus to determine the freezing point of blood (*Cryoscopy*).

He showed this apparatus, and explained the theory of its use. Koranyi, adopting the law formulated by Raoult that "all solid substances dissolved in a definite quantity of liquid, itself capable of freezing, lower its freezing point, and do so in proportion to the degree of concentration," found that normal blood has a freezing point—0·56 C. lower than that of distilled water. His observations have been verified by others, and it has been shown that a variation of two-hundredths of a degree above or below the normal, indicate an imperfect functionating power of the kidneys.

Beckmann's apparatus consists of a receptacle (glass) for ice and salt into which a test tube is dipped. Into this test tube through a perforated cork another test tube is passed so that an air chamber is obtained between the two. Into the latter test tube a finely graduated thermometer is introduced, the fluid or blood to be tested having first been placed in the tube in a quantity sufficient to cover the bulb of the thermometer. The freezing mixture cools down the fluid and the mercury column falls two or three degrees below zero, but at the moment of freezing the mercury quickly rises until it attains a maximum point at which it remains for an appreciable time. To prevent irregular cooling of the fluid it is kept constantly moving during the experiment by means of a platinum ring stirrer. It is necessary to standardise the thermometer before determining the freezing-point of blood, so that the freezing-point of distilled water is known, as to estimate the difference between the two that of the blood must be calculated from that of the water. Thus, if the freezing-point of water on the scale be 3·01 C. the normal freezing-point of blood would be 2·45 C. = 0·56 lower. If, then, the blood has a freezing-point of 2·43 C. it means a freezing-point—0·58 = $\frac{8}{100}$ths lower than normal, which is an indication of imperfect elimination of tissue products by the kidneys pointing to imperfect functionating power. Clinically such a degree of imperfect functioning contra-indicates any serious operative procedure, as the risk of death from uræmia is considerable.

The blood to be examined may be taken from any vein in the arm, and the quantity required is about two and a half drachms. Coagulation of the blood does not invalidate the test.

The apparatus can be got from Dr Muencke, of Berlin.

2. *Dr Dawson Turner* exhibited—

(*a*) Apparatus for measuring the electric resistance of the blood.

During the last five years various attempts have been made by him to devise a satisfactory method for measuring the resistance of the blood.

The method which gave the best results and which is now employed is the following.

Five cubic millimetres of freshly drawn blood are placed between two cup-shaped electrodes, three millimetres in diameter, coated with spongy platinum and fixed at 0·72 mm. apart.

The average resistance of normal blood at 60° F. measured by Kohlrausch's method in this apparatus is 550 ohms. A striking change may be seen in pernicious anæmia, the resistance in this disease being sometimes diminished to about one-half that of normal blood. The deduction is that the blood in pernicious anæmia contains an abnormal amount of salts.

(*b*) SYPHILIS AND THE RÖNTGEN RAYS. In a case recommended to me by Dr Wilson of Mavisbank and seen also by Drs Dunsmure and Alexis Thomson, the bones of the patient, who had a marked specific history, were found to be extraordinarily transparent to Röntgen Rays. I am not aware that this has been previously noticed.

V. ORIGINAL COMMUNICATIONS

1. SOME CLINICAL OBSERVATIONS UPON THE TEMPERATURE OF PHTHISIS BASED UPON EXPERIENCE OF ONE HUNDRED CONSECUTIVE CASES TREATED BY OPEN-AIR METHODS

By DAVID LAWSON, M.A., M.D. (Ed.), Senior Physician of Nordrach-on-Dee Sanatorium, Banchory, Scotland

IT is in the full knowledge of the very dubious mental attitude adopted towards the sanatorial method of treating phthisis, which characterises a large proportion of the medical profession in Scotland, and of the expressed willingness of many whose old faiths have become shaken, and whose new beliefs are not

yet crystallised, to weigh and consider clinical evidence when adduced, that this paper has been written.

For the purpose of lucidity the following facts have been grouped around a central point, viz., the temperature of phthisis.

Now in order to illustrate the various conditions as they arise for consideration, two kinds of charts will be used, viz., (*a*) daily ; (*b*) average chart (fig. 1). Only the latter calls for explanation. It was designed by Chapman and first used in his Sheffield work. Its purpose is to give a bird's-eye view of the variation in temperature, weight and sputum in a case over a period of months. It is made on the metrical system. The average of the highest point obtained on four consecutive days is taken and indicated by a dot. The lowest point touched is similarly treated. There is thus obtained a series of points at a high level which are joined by a line. Similarly a series of points at a low level which are also connected. The intervening space is then filled in. This then gives (1) the average highest point; (2) the average lowest point; (3) the average amplitude of the temperature.

The 2nd chart exhibits in a typical manner the behaviour of the temperature in an ordinary case of fibro-caseous tuberculosis which is running a favourable course. But it shows more than that. It furnishes an illustration of what may be regarded as a *fundamental rule*, viz., that progress towards arrest in an active lesion is characterised by well-marked clinical phenomena which appear and are maintained simultaneously. These phenomena are as follows :—

(1) Weight is gained.
(2) Pulse rate falls.
(3) Respiration rate falls.
(4) Temperature falls by lysis, and
(5) Diminishes in amplitude (not so in miliary cases).

In this particular instance, that of acute fibro-caseous tuberculosis in a male of twenty-two years of age, the treatment extended over a period of six months. During that time the approximate fall per minute in the pulse was from 95 to 78, in the respiration from 23 to 13 ; the temperature was diminished in amplitude by almost one degree centigrade, and the net gain in weight obtained amounted to 17 lbs.

In contra-distinction to that favourable view, chart No. 31

exhibits the leading features of a similar case which is running an adverse course. It is noticeable that here, along with a steady declension of the body weight, there was a marked failure in the temperature, either to fall in height or diminish in amplitude of range.

But if it is certain that for the patient's welfare those clinical features which have been described should be present in combination, it is equally certain that any marked deviation from their association together suggests good grounds for apprehension so long as that deviation persists. Thus I have seen, on more than one occasion, death occur after a considerable gain in weight had been acquired.

In the case to which the next chart (No. 4) refers, the record of one week is shown. During this week, although the patient's condition was a critical one, he nevertheless gained 5 lbs. in weight, and within a few days of death actually weighed over 12 lbs. heavier than when he first came under observation. Thus, notwithstanding the fact that the patient was gaining weight and to that extent appeared to be improving, he was in reality losing ground.

In the case to which chart No. 5 refers, the force of the observation that deviation from the general rule is of unfavourable import, is even more marked than it is in this one. Here, as you will observe, not only a gain in weight, but a fall in temperature was recorded. And yet the tendency was downwards. The favourable prognosis which the condition of the weight and temperature readings at first sight seemed to suggest were not supported by other elements in the case. The presence here of Ehrlich's Diazo reaction in the urine was an extremely unwelcome factor.

I may say in passing that my experience of the presence of this reaction goes to support the view which is generally held of its unfavourable import. Of three cases in which I have recently known it to be present, two have died, and the condition of the third, at present under treatment, is an extremely critical one.

Passing now to consider the temperature of phthisis, it has been observed that it is characterised by two qualities :—

(1) Inelasticity. (2) Instability.

By inelasticity I mean that tendency which temperature exhibits when disturbed by any exciting cause to remain

in the altered condition after the disturbing factor has been withdrawn.

This is well illustrated on chart No. 6, which indicates the levels at which the temperatures of three different persons stood taken one hour after exercise. The temperatures rose approximately to the same height. When, however, an hour's rest had been taken, whilst the temperature of the patient with the active lesion had remained almost stationary, and that of the patient with the nearly-arrested lesion had fallen fully half a degree, that of the healthy person had fallen over 2° F.

By *instability* I mean a marked sensitiveness to reaction, an extreme liability to become disturbed in the presence of apparently trivial influences, influences so slight that they produce practically no effect upon the temperature of a healthy person. Among those may be cited slight derangements of the digestive or nervous systems, or marked variations in the temperature of the surrounding atmosphere.

Chart No. 7 shows respectively the rise in temperature following a sudden unexpected visit of patient's mother, a rise of temperature of gastric origin which promptly yielded to the action of small doses of calomel, and temperatures due to the condition of the surrounding atmosphere. In the case of the last record here, it is noteworthy that on those days on which the temperature of the patient did not rise so high, the temperature of the atmosphere was also lower than on the other days.

During the hot weather of last July, I found the temperature readings at midday more or less disturbed uniformly over the whole forty patients under observation at that time. In some cases the rise that took place reached as high as 103·5° F., and in two cases 104° F. was touched. The rise was, of course, transitory. I could not account for it in any other way than that which has been suggested.

Method of taking Temperature.

It is not my intention to detain you with one's experience of the various methods of recording temperature readings, further than to refer to the urinary and rectal methods. The employment of the urinary method which necessitates the use of a very sensitive instrument—not exceeding thirty seconds—is strongly advocated in certain continental circles. It is claimed that the urine coming as it does from the region

of the hottest organ in the abdomen, viz., the liver, ought on that account to show a higher and more sensitive reading than can be obtained by other methods. But for all practical purposes I have not found it so; and am of opinion that the æsthetic and prudential objections to its use far outweigh in importance any visionary advantages which it may be thought to possess.

It has been my good fortune to meet with several patients whose interest in science, we shall not call it curiosity, was such that of their own accord they put the claims of those who advocate the employment of this method to the test. In the next two charts you will see the record of two sets of observations which were made by a patient in which the temperature was taken simultaneously by rectal, urinary, oral, and axillary methods. That man was a student and an enthusiast. Imagination will best picture his attitude whilst engaged in this engrossing research. The former (No. 8) represents the various temperatures taken after the patient had taken a measured amount of exercise, the latter (No. 9) those of rest. In both the urinary curve occupies an intermediate position between the rectal and oral readings, and its relationship to them is fairly constant.

Many hard things have of late been said of *rectal temperatures*. Nevertheless, after an extended trial of all the methods, I am firmly of opinion that the rectal method of taking temperatures is incomparably more reliable and better than any other, and should be adopted in every case of pulmonary phthisis. I say in every case, but of course exception must be made in those cases which are complicated by the presence of hæmorrhoids, ischio-rectal abscess, anal fissure and such local disturbances. An undue importance has been attached to the æsthetic objection. To those who urge it I can only remark that I have not yet met with a single patient, male or female, who, when the bearing of the matter had been frankly explained to him or her, and the decision left in that patient's hands, the patient did not adopt the rectal method.

Personally, I recommend every patient who comes under my care always to take their temperature by the rectal method.

Its advantages, which are very real, are as follows:—

(1) It is not so liable as the mouth to be disturbed by

external conditions, such as "cold drinks, mouth breathing, etc."

(2) In some cases of *genuine relapse* the rise in temperature appears in the rectum *some time before* it gives any indication elsewhere. The difference in time may amount to as much as twelve hours. This early indication enables the physician in charge to recognise and therefore to treat the disturbance at an earlier stage than if he had depended for guidance upon the axillary or oral readings.

(3) *The rectal temperature rises higher both relatively and absolutely* at such times than it does elsewhere. A reference to chart No. 9 illustrates this point. It is therefore more likely to attract notice and direct attention towards the disturbance than the smaller rise which the oral reading would show.

(4) *The rectal temperature is disturbed by trivial factors*, such as slight indigestion and nervous causes, which often do not affect the axillary range. Even these trifling irregularities are best dealt with early ; and this, by directing the physician's attention to the matter, the rectal reading procures.

(5) But it is when we begin to deal with the question of when to begin and how to regulate a patient's exercise that the great value of rectal readings is seen.

In deciding the fine point as to when a patient should begin exercise, after a long period has been spent in bed, the decision frequently turns upon the state of the temperature range. In some of these cases the axilla as a guide is quite worthless, and the mouth nearly so. Here the rectal guide will invariably be found reliable.

In view of those clearly established advantages, and I am satisfied from close and careful observation that they are clearly established, I cannot too strongly urge the more general adoption of the rectal method in all cases of pulmonary tuberculosis.

But if the case made out for a more general adoption of the rectal method of taking temperature is a strong one, that which calls for *more regular, frequent, and systematic readings than are usually kept is even stronger.* Meeting as one has done from time to time with errors in diagnosis, and therefore of treatment and prognosis directly traceable to imperfect temperature readings, one feels that some protest is called for against the casual and airy methods of private practice. It is

customary for the physician in attendance to take the temperature of the patient at the time of his visit. This visit, if a daily one, may take place at very different hours on different days. Now since the temperature of a healthy person wanders over a considerable range—somewhere exceeding 1° F.—in the course of twenty-four hours, and that of a tuberculous patient over an even larger range, it is evident that readings which differ very widely from each other may thus be obtained, and that without any change having taken place in the patient's condition. From the ignorance of this fact I have known a variety of mistakes to be made, many of them serious mistakes. Some of these are illustrated in the following charts :—

Chart No. 10 represents a case which was at first mistaken for one of typhoid fever. Widal's reaction having proved negative, tuberculosis was suspected, and a four-hourly chart then kept. The right hand side of the chart shows the typical tuberculous record which was thus obtained, and enabled a definite diagnosis of tuberculosis to be made—a diagnosis, the correctness of which time abundantly confirmed. The suggestion naturally arises, that if a four-hourly chart had been kept from the first, the tuberculous nature of the disturbance would have been at once recognised, and so valuable time saved. In this case the absence of sputum increased the difficulty of arriving at a definite opinion.

Chart No. 11 shows a case where a doctor, calling in the vicinity of 10 A.M. and 10 P.M., found the temperature practically normal, and erroneously inferred that the case was an apyrexial one.

Chart No. 12—taken from Fowler and Godlees' work, p. 326—represents an inverse temperature which could never have been recognised by a daily forenoon visit or even a night visit, or both together. The temperature taken at those times would have been comparatively low, and the serious nature of the mischief might in this way have remained unsuspected.

In view of such evidence I cannot but feel that as an aid to diagnosis, and to a less extent to prognosis, the usual custom of trusting to one reading is not merely unreliable, but in a number of cases positively useless. In every case of pulmonary phthisis which is sufficiently serious to require the attention of a medical man, and every early case comes under that category, the temperature ought to be taken and recorded at least four

times daily. The nurse, or patient, can be taught to take it herself and a record should be kept. The charts should then be placed in the hands of the doctor as he calls from day to day. If this is not done the value and soundness of his advice must necessarily at times very materially suffer.

Temperature in relation to exercise is a much more complicated and intricate one than we have hitherto been asked to believe. It has been customary to assume without cavil the truth of the two following dicta :—

Firstly.—That exercise always causes a rise of temperature in the tuberculous subject.

Secondly.—That a temperature of 98·6° F. at 8 A.M. contra-indicates exercise.

Now, whilst those statements are for the most part true, they are open to so many exceptions that I think the position calls for restatement from the commencement.

The restatement which I now venture to submit is as follows :—

The effect of exercise upon a tuberculous subject is twofold.

(1) Exercise depresses temperature.

(2) Exercise raises temperature.

You will readily recognise in this chart No 13 the typical subnormal range of temperature present in an ordinary case of chronic fibroid phthisis. Previous to this point the patient was kept at rest, and as you see the temperature stood practically about normal. Under 1¼ mile walk the temperature fell a whole degree C., and when again that exercise was discontinued the temperature rose again to the level at which it at first stood. I have no doubt that the low temperature in this case represented a temperature of exhaustion, brought on by the exercise small in amount though it was. It is an example of exercise producing fall in temperature.

But the next (chart No. 14), that of a fibro-caseous type with distinct cavity formation present, calls for somewhat fuller notice.

The patient, chiefly out of respect for the time-honoured view that a morning temperature of 98·6° contra-indicates exercise, was put upon a full diet and kept entirely at rest, until at the end of eight weeks it was found she had gained over twenty pounds in weight. Now, notwithstanding the gain in

weight which had taken place, no improvement was manifest in her temperature. The 8 A.M. as before remained at 98·6°. At this stage a very careful physical examination was once more made, and the whole case completely investigated in all its bearings. As a result of this step it was resolved to respect the ties of custom no longer and to begin exercise at once. Exercise was accordingly begun, and steadily and gradually increased until a distance of four miles was being covered daily before lunch. From this point onwards, not a little to my surprise, very marked improvement became manifest all round; and in no direction was the change for the better which took place more manifest than in the temperature. It fell almost at once; and the improvement in this respect proved to be a permanent one.

This is a case which puzzled me not a little at the time, and I have seen others like it since then. It exemplifies the danger there is in trusting to hard and fast rule, and the great necessity for individual consideration of each separate case.

The second proposition, viz., that exercise raises temperature, hardly calls for illustration. It is the general experience, and may be seen in three out of four cases.

However, for completeness, chart No. 15, illustrating the point, has been inserted.

But of infinitely more importance than the extent of the rise in temperature produced by exercise, is a characteristic of that rise which I believe was first recognised by Bardswell. Already briefly alluded to as the "inelasticity of tuberculous temperature," it now calls for more detailed consideration.

Chart No. 16 shows the behaviour of a temperature produced by exercise in a tuberculous subject. It also shows a similar degree of temperature produced in myself, a healthy subject, and produced in a similar manner. By contrasting the behaviour of the healthy with that of the tuberculous temperature, you will the more fully appreciate the striking nature of the characteristic which is referred to.

After rest was resumed the temperature of the tuberculous person began to fall, and it did so slowly. It fell ·1° C. in 15 minutes; a further ·2° C. in 30 minutes; and at the end of 60 minutes it had fallen ·9° C. Yet the temperature of the healthy person fell as much in 15 minutes as that of the patient did in 60 minutes.

Now this feature of the tuberculous temperature, this tardy return to normal after exercise, is one the importance of which it is difficult to overestimate. For in it we have an indication of great value, enabling us to determine the amount of exercise it is desirable to prescribe in any given case. If the exercise taken has not transgressed the limits of beneficial exercise, the temperature will invariably fall to 37°C., or within 3 points of it, during the next hour. Should it fail to do so then, there are good grounds for caution. Next day a diminution either in the amount or in the pace at which the exercises is taken should be advised.

This feature, it is claimed, is characteristic of the tuberculous temperature, and as a guide enabling one to regulate within the limits of safety and benefit the exercise prescribed, is invaluable.

My experience abundantly supports that claim which has been made.

There is a statement dealing with this subject which has been much in evidence during the past two years. It is to be found in the pages of nearly every recent medical book which deals with lung diseases, and it has on not a few occasions seen the light in daily papers which purport to guide the public in matters medical. The statement was made in Germany, and need not on that account be accepted without inspection. The statement is to the effect that should a person's temperature, taken immediately after exercise, exceed 100·4° F., then the limits of beneficial exercise have been passed, and he should remain absolutely at rest during the remainder of the day.

Chart No. 17 is one of many which could be produced showing that such is not the case.

At the time those records were being kept, the patient's temperature was daily materially exceeding the restriction which that dictum seeks to impose. As you will observe, it occasionally touched not 100·4° F., but 101·4° F. And still the patient's progress was, and still continues to be, most satisfactory in every respect.

My experience does not accord with those who urge this statement. Indeed it is diametrically opposed to it. I believe that the altitude of temperature rise is really a matter of very minor importance. My own temperature rises to 101·6° after a smart five mile walk, and I shudder to contemplate

the altitude it must sometimes have attained in football days. The really crucial question to ask is not "How high does the temperature rise?" but rather, "How long does it remain there when it has risen?" Where only a slight rise in temperature has taken place, if that rise is maintained for two, three, or four hours, then we are safe in assuming that the limits of beneficial exercise have been passed. On the other hand, exercise which produces a temperature far exceeding 100·4° F. may prove most beneficial, provided always that a proper return to the vicinity of normal has taken place within the prescribed hour.

So thoroughly satisfied are we now with the accuracy and value of this observation, that it is daily utilised in our régime. It is a matter of routine that patients returning from exercise at twelve o'clock are required to take their temperature at once. After an hour's rest the temperature is again taken at one o'clock before going to lunch, in order to ascertain what fall has taken place. Upon the character of the information vouchsafed by these readings largely depends the nature of the advice which is given regarding their future movements for the day.

What, then, it may be asked, is the practical bearing of these observations upon treatment? *Firstly*, the rectal method of taking temperature should be more generally adopted. *Secondly*, more frequent and systematic records of temperature readings should be kept than at present obtains. *Thirdly*, the custom which proscribes further exercise where a temperature of 100·4° has been recorded, is useful in a large number of cases, but its application as a rule to all cases is discredited. *Fourthly*, an attempt to carry out any phase of the treatment by fixed regulations and rules must frequently end in disaster. *Fifthly*, the too common tendency to consider the lungs only must be discouraged. The examination of the chest must be thorough; but the condition of the various organs and their excreta, together with the light which systematic laboratory investigations throw upon them, is hardly less important. All those elements must be thoroughly weighed and pondered in considering the treatment of any case of phthisis. Only when this is done, can we reasonably hope for the best results in treating our tuberculous patients.

Coming now to consider the practical bearing of those

observations as they affect treatment, one is tempted to ask what part should the condition of the temperature play in guiding us as to what to advise. The answer must be that while of great value, probably of more value than any other sign, it is not altogether safe to trust temperature indications entirely. In the majority of cases the general rule holds good, and a rectal temperature of 98·6 at 8 A.M. contra-indicates exercise. But in the residuum of cases which do not come under that category, I have frequently found it an extremely difficult point to decide when exercise should be commenced. The pulse gives indications of some value, a value which I believe upon the whole has in some quarters been over-estimated. No single sign may be trusted, be it the weight, the pulse, or the temperature. An all-round view of the case with its physical signs and symptoms should be taken, and in interpreting these aright the experience of the medical adviser counts for much. Anyone who has attempted to work at this subject must feel the difficulties of the task, and in the circumstances the formulating of hard and fast rules for treatment is to be deprecated. That the time for conducting any phase of the treatment on rigid lines and by fixed regulations has passed away, is abundantly clear. Whether it be in the dieting, the drugging, or the exercising of our patients, individualising is essential, and the more conscientious, careful, and complete is the nature of the examination, not only of the lungs, but of the various other organs of the body, and the more thorough and minute are the investigations into the condition of the various secretions and excreta, and the clearer the light which the operations of the laboratory brings to bear upon those facts, the more likely will the physician in charge be able to advise his patient to the best advantage.

2. SUPRAPUBIC PROSTATECTOMY

By DAVID WALLACE, C.M.G., M.B., F.R.C.S.Ed., Lecturer on Surgery, Assistant Surgeon, Royal Infirmary, Edinburgh

IT is necessary that I remark shortly upon some general points regarding prostatism, or the prostatic state, before I take up the subject proper of the paper I purpose to read this evening. A patient may suffer from all the symptoms usually associated with hypertrophy of the prostate, and yet the prostate be not at all enlarged. This fact has led Poncet to divide cases of

prostatism into two groups, (1) those due to enlargement of the prostate mechanically interfering with the outflow of the urine, and (2) those due to septic conditions, without enlargement of the prostate, which present similar symptoms to cases with enlarged prostate. This difference in cause in so-called prostatic cases at once leads to a difficulty in diagnosis, and in the determination of suitable treatment. The question arises, Is the prostate enlarged? A consideration of the symptoms alone cannot definitely determine this. Enlargement of the prostate detected on rectal examination does not necessarily imply any mechanical obstruction to the urethral orifice. An apparently small prostate per rectum does not exclude the presence of an intravesical enlargement, which may be a mechanical cause of difficulty in micturition. Measurement of the length of the urethra may assist diagnosis, but not necessarily. Cystoscopic examination may give more information, but it is especially in cases of enlarged prostate that difficulty is frequently experienced in cystoscopy. This is especially true in those cases where there is much bleeding.

At the outset, therefore, we have in some cases much difficulty in judging of the condition which is present, and the plea for suprapubic cystotomy is strengthened from the standpoint of diagnosis. The view of Guyon that "the radical treatment of enlarged prostate does not exist, nor can it exist" still holds in the sense that no one method of treatment can be termed radical when applied to all cases.

I do not propose to discuss those cases included by Poncet in his second group, in which no enlargement acting mechanically is present, but I may say that in them castration would be futile, and that suprapubic cystotomy, for reasons to which I shall refer later, is probably the operation of choice. I wish to-night to allude to cases in which the prostate is enlarged.

The etiology of the condition commonly termed hypertrophy of the prostate has not as yet been satisfactorily determined. The enlargement is known to occur most frequently in persons above middle life, but the statement made by Sir Henry Thompson that it does not occur in persons under 54 years of age is recognised to be erroneous. The view of Guyon, upheld by the French school, that enlargement is secondary to arterio-sclerosis is untenable. Whatever

the origin, the enlargement is frequently due to the formation of masses of glandular tissue which form fibro-adenomatous tumours, or to fibro-myomatous tumours similar to those so frequently met with in the uterus. The importance of the condition is chiefly its mechanical effect upon micturition and the secondary changes caused by this. Three varieties of enlargement may be recognised—

1st. The *vascular* where it consists chiefly of almost erectile tissue.

2nd. The *fibrotic*, a general enlargement without tumour formation. These as a rule are small. Sixteen out of thirty-one specimens in the R.C.S. Museum are fibrotic.

3rd. The *fibro-adenomatous* and fibro-myomatous, in which actual tumours are present.

Any one of these may act mechanically to produce bladder changes, and those symptoms associated with over-distension grouped together as those of "chronic incomplete retention." Complications such as calculi or cystitis, or severe hæmorrhage, may also be present.

Four[1] methods of treatment are at present in vogue to deal with the condition.

1. Catheterisation.
2. Cystotomy—(*a*) perineal, (*b*) suprapubic.
3. Castration or vasectomy.
4. Prostatectomy—(*a*) perineal, (*b*) suprapubic.

Any one of these may be indicated in an individual case; but, personally, I believe we should use the catheter, if possible, only in those cases in which the condition has not reached *atony* of the bladder; and *castration* or vasectomy only in those where catheterisation has become more difficult or associated with cystitis or bleeding, which has come on subsequently to the use of the catheter. I recognise that castration and vasectomy have met with much success: thus Wood in a recent series of 159 cases, which does not include either White's or Cabot's, states that there were 13 deaths, and of 130 in which the result is stated, 90 per cent. were improved. Regarding vasectomy Wood gives a series of 193 cases in which 118, *i.e.* 67 per cent., improved after operation. Both of these procedures, however, have the great disadvantage that

[1] Bottini's operation with the electro-cautery is advocated by some surgeons, but at the most it is working in the dark, and not in my opinion to be recommended.

accurate diagnosis is not possible, and if either fail to relieve the symptoms time has been lost, and the patient later has to submit to cystotomy. The operation has been performed inadvertently when malignant tumours were the cause of the bleeding or other symptoms. Apart from this, however, the mortality of castration is as high as for prostatectomy if all cases are considered. I do not acquiesce in White's or Cabot's specious and special pleading, which serves to reduce the mortality of castration: it may be statistical reduction, but it is not practical fact.

Perineal cystotomy[1] can very seldom, if ever, be a better or safer procedure than suprapubic cystotomy. It is the procedure which I would wholly discard. Suprapubic cystotomy is particularly advantageous, as it enables us to see precisely what the condition in the bladder is, and to deal with it as we think best. I would advocate its adoption in all cases of prostatic trouble which have passed the early stage, *i.e.* where we have complications and more particularly when accompanied by atony of the bladder wall. It enables us to investigate every part of the bladder, and to carry out any further procedure we may deem needful. We can drain the bladder with Cathcart's adaptation of the sprengel pump with the knowledge that the bladder wall will gradually contract and in many cases eventually recover its expulsile power. If need be a prostatotomy may be performed (Harrison's operation done from within instead of perineally) or the operation of prostatectomy may be adopted. The late Mr M'Gill of Leeds in 1888 and 1889 read papers advocating that the prostate should be attacked through a suprapubic opening in the bladder, and an attempt be made to remove the mechanical obstruction to the outflow of urine. He detailed illustrative cases and related the results in cases after operation. These papers initiated a new method of treatment, which has been modified from time to time, but the essential factor remains as enunciated originally by M'Gill, to whom great credit is due. With regard to it much depends on the condition of the prostate. A middle lobe is readily removed. Large adenomatous growths can be enucleated, and these are the favourable cases to treat by this operation. I do not believe

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[1] Perineal prostatectomy has been recently strongly advocated by Albarran, but has not any advantage over the suprapubic route. I believe it has many disadvantages.

all prostates are suitable for even partial removal. I am certain that complete removal of the prostate without opening into the urethra is an anatomical impossibility.

This operation, which seems so rational, has not been adopted so universally, even in suitable cases, as might have been expected. I believe three factors have influenced surgeons against it.

1st. The supposed *danger* of suprapubic operations.

2nd. The relief given in prostatics by "*catheter life.*"

3rd. The introduction a few years later of an apparently rational and safe operation, *castration.*

With regard to the first of these it is only reasonable to think if suprapubic cystotomy *per se* be dangerous, that if prostatectomy be added the danger will be intensified, and at once there is a strong argument against M'Gill's operation.

Facts are infinitely more valuable than theory, and I give you the statistics of my personal experience. The operations, forty in number, were performed for very different conditions, such as tumours, calculi, tubercle, enlarged prostate—I include prostatectomies, and in the majority the urine was septic, while in many instances the patients were very ill. I have had five deaths, *i.e.* a percentage mortality of 12·5. The cases in which death occurred were as follows:

I. A palliative operation in a case of vesical tumour to relieve pain and arrest bleeding. Bleeding ceased and the pain was relieved, but the patient died seven days later.

II. A palliative operation in a tuberculous cystitis case, when the patient was so miserable from pain and constant desire to micturate, that anything to relieve his misery seemed justifiable. *He lived eleven days* in comparative comfort. At the autopsy one kidney was riddled with tuberculous abscesses and the other was a small cyst with a congenitally defective ureter.

III. Another tuberculous bladder case. The patient was almost *in extremis*, and no operation should have been done; he died in seven hours.

IV. A case of septic cystitis secondary to enlarged prostate complicated by stricture. Repeated aspiration had been used and a prevesical abscess with stinking pus was opened at the operation. He died in thirty hours.

V. This was a prostatectomy. The patient died on the 19th day.

So far as these cases go I think I am justified in saying suprapubic cystotomy *per se* is not a dangerous operation I see no reason why it should be. It is easy and rapid in performance. With reasonable care the peritoneal cavity is safe, and prevesical cellulitis is, I think, almost chimerical: I have never seen it in my own or any one else's practice.

As regards the other two factors which I think may have influenced surgeons, I have already stated when in my opinion they should be adopted, and I now pass to speak of one or two other points in relation to prostatectomy.

Projecting middle lobes can be readily removed, whatever their constitution may be—not infrequently they are fibro-adenomatous, and then they can be almost completely enucleated; when more fibrous they require division at their base. Fibro-adenomatous or fibro-myomatous masses in the lateral lobes lend themselves readily to enucleation, but if adherent at any point such attachments can be divided with curved scissors, bleeding as a rule being slight. The larger the masses, in my experience, the easier the operation; but in no case is the operation specially difficult. Septic urine has been thought to be a contra-indication, but although, as is self-evident, sepsis adds to the risk I do not think it contra-indicates removal of the mass at the time of opening the bladder. In eleven cases in which I have operated the urine has been septic in ten. In only one was it possibly aseptic. This is an important point as, if it be true, it does not strengthen the view that the operation should be done in two stages. To operate even a day or two after the primary cystotomy adds considerably to the difficulty of operation, as the bladder by then has contracted, and the relations of the parts are considerably masked and there is less room for manipulation.

Bleeding, in my experience, is not great, and has always been readily arrested by washing out the bladder with hot water, but even if this did not suffice to stop hæmorrhage other means can be adopted. I would advise, however, that the sprengel pump be not used for three or four hours after operation as I think in one case it kept up some bleeding which quickly ceased when the pump was removed and suction stopped; no further treatment was needed. Simply

introduce a glass drain and later through it pass the rubber tubing.

Permanent fistula.—In none of my cases has this resulted. Remove the obstruction at the neck of the bladder, make a patent normal canal and the abnormal one quickly closes.

Duration of Drainage.—I remove the tube at a varying period. If the bladder be contractile the drainage may be stopped at any time from a day or two to ten days; but if there has been atony of the bladder you wish the bladder wall to have rest so that it may contract and regain its tone, and if there be nothing against keeping the patient in bed I keep up the drainage in such cases for three or four weeks.[1]

If Goldmann's views be correct regarding the advantages of anterior ventrofixation of the bladder the fixation of the anterior wall of the bladder to the anterior abdominal wall which results after such drainage must act equally beneficially, and is a further reason in favour of suprapubic cystotomy. I cannot enter here into particulars regarding Goldmann's work, but I consider it goes far to strengthen the view that suprapubic operations in this way may prove valuable even when the prostate is not excised.

With regard to the cases upon which I have operated. They are eleven in number.

Their age averaged 64 years. The oldest 74. The youngest 54. Three were above 70. Three were 67. All were temporarily improved.

Five have remained well since operation. One for eight years. In his case I removed adenomatous growths from both lateral lobes. He had used the catheter for two years night and day. He did not require it from six weeks after operation.

I shall not detain you by a detailed account of all the cases, but I may say

In 5 cases there was a middle lobe.

In 4 cases the lateral lobes were enlarged, and 1 of these had an enlarged middle lobe as well.

In 1 case the prostate was enlarged circularly around the urethral orifice.

In 1 case the left lobe only was enlarged by an adenomatous growth.

In 5 cases there was a cure.

[1] The patient may sit up in bed a day or two after operation.

In 4 cases marked improvement.

One patient, although temporarily improved, had a few months later all the symptoms as bad as ever. There was a calculus in the bladder when I saw him next. This was the case in which the prostate was enlarged circularly around the urethral orifice, and in it the operation of excision was performed in two stages, the second, five days later than the cystotomy.

One patient died on the 19th day after operation. The wound was healed, and on autopsy the bladder wound at the site of the excised lobe was cicatrised over. He had chronic interstitial nephritis, but no actual cause for death was discoverable.

I may quote from four letters I have received regarding four cases, but in them the operations have been performed within one year from now.

1st. *D.*, 67.—Much hæmorrhage, suspected tumour, middle lobe found and removed at operation.

"Health is fair, as good as one can expect it to be considering the condition of his other organs. He does not require the catheter. He passes water very often, but has no pain nor difficulty in doing so. He has passed no more blood."

2nd. *C.*, 74.—Much hæmorrhage, vasectomy one year ago with temporary improvement, but catheterisation became more difficult. At operation bilateral enlargement of prostate with eleven calculi. Prostate excised.

"1. Wound completely healed.

2. No catheter required.

3. Better than he has been for ten years when he began catheter life."

3rd. *C.*, æt. 72.—Required catheter for one year, much blood and pus in urine. Middle lobe removed and *calculi.*

"General health excellent. Rises twice at night. A *little* pain at end of micturition. Does not use catheter. Urine acid and quite clear."

4th. *S.*, æt. 67.—Very large bilaterally enlarged P., some small calculi. Catheter required constantly. Much pain and occasional hæmorrhage, and catheterisation more difficult.

"Urine passes naturally and without difficulty. Rises at night two or three times. Catheter never required. Patient says he is immeasurably better, not been so well for seven years."

Meeting III.—December 18th, 1901

JAMES ANDREW, M.D., F.R.C.P.Ed., *Vice-President, in the Chair*

I. EXHIBITION OF PATIENTS

1. *Mr Charles W. Cathcart* exhibited a patient after drainage of both pleural cavities for DOUBLE EMPYEMA, and recovery without any plastic operation.

Master R. I., aged 15, a boy whose previous health was good, took to bed on January 2nd, 1900, and developed double pneumonia with great dyspnœa, culminating on January 13th in a semi-crisis. This showed itself in a fall of temperature, but not in rate of pulse or of respiration. Dr William Miller, his medical attendant, had suspected slight pleural effusion on the left side before the semi-crisis, and on January 16th aspirated 1½ pints of pus from that side with the aspirator with considerable relief.

On January 18th the left side was tapped again, but only an ounce of pus was withdrawn. The right side was now also suspected—the patient having urgent orthopœa and cyanosis. Mr Cathcart was called in, and withdrew about 25 ozs. of pus from the right pleural cavity. Three hours later a portion of the 5th left rib was excised under local anæsthesia and a whiff of ether. A large quantity of flaky pus was evacuated, and a drainage tube inserted. Patient obtained great relief and was able to lie down and sleep. (Pus showed pure culture of Pneumo-Coccus.) January 22nd, 36 ozs. of pus were withdrawn from right side with aspirator. January 25th, *i.e.* a week after first operation drainage of right pleural cavity was performed as on left side, and a large quantity of thick flaky pus was evacuated with much relief to symptoms. Wound on right side healed February 27th, that on left side healed January 6th. Patient allowed out of doors on March 13th.

Means taken to aid expansion of lungs were—careful antiseptic precautions, inflation of Wolff's bottles by patient, and use of bag to cause negative pressure in pleural cavity. The latter, however, worked with only partial success.

2. *Dr Allan Jamieson* exhibited—

(*a*) A case of LUPUS VULGARIS, treated at the London Hospital, and apparently cured by Finsen's Light Treatment.

J. L., 28. Healthy lad brought up in country. When a child struck his chin against a table, and in the bruised spot lupus developed. He was seen on many occasions, and was treated by various methods, with improvement, but not cure. The disease disappeared from the upper part of the chin, but just beneath it there was a longish patch, about two inches by one, in the summer of 1900. He had five weeks' treatment, in the London Hospital in September 1900, but was then unable to go on with it. He states that he received considerable benefit, but that the disease was practically as bad as ever when he again went back in July 1901. Indeed he thinks that the disease recurred more rapidly than before, it very soon spread to its former dimensions. Between the 20th July and the 21st October he had 55 exposures, each for about an hour and a quarter. With exception of 4 when he had the new French lamp, all were with the Einsen arc lamp. There was difficulty in getting the glass to fit in his case, when the French lamp was used. The reaction varied with the strength of the light, which, he says, was not always uniform. The longest interruption in consequence of reaction was a week, usually only two days. The space dealt with at a time was about the size of a sixpence. After treatment the parts were dressed with boric ointment. The whole surface is now represented by a smooth white soft scar. This is slightly pitted, and there are some pinkish dots in it, but these do not show any lupus nodules when the diascope is applied, so that so far as our means of determining admit, the disease is apparently cured. It should be mentioned that the exposure in the case of the French lamp was twenty minutes.

(*b*) A case of RODENT ULCER partially treated by the X-rays, and apparently cured.

Mrs. B., æt. 41, Hamilton, admitted to ward 38 on September 21st, 1901. She is a strong healthy woman, whose sole ailment was two contiguous patches of rodent ulcer on the left side of the forehead. Three years since a small papule developed at the extreme left margin of the forehead ; this itched to some extent, was scratched in consequence, and scabbed over, but did not heal, and slowly but steadily enlarged. A second spot appeared, nearer the centre of the forehead, and these when seen were rather larger than a florin, had a granular eroded surface, on the whole somewhat elevated

above the level, and with well-marked rolled edge. Only a small area of unaffected skin separated the patches. The skin was freely movable over the frontal bone, though thickened. Between the 21st September and the 16th October the sole treatment consisted in exposures to the X-rays at a distance of two inches from the tube, and for ten minutes. In all she had twelve exposures. Some islets of epithelium appeared within the diseased areas, but as progress was slow and not sufficiently satisfactory, the surfaces were thoroughly scraped on the 17th October, and the following day chromic acid fused to a bead on a probe was applied, and the part dressed with Beiersdorf's zinc ichthyol salve muslin. She was sent home. She returned on November 18th with the wound healed. At the very margin there was still a slight hem-like ridge, and at the point where the areas nearly joined there was a more defined elevation. The exposures were resumed, and repeated till now four times a week for nearly a quarter of an hour each time. The margins have been also gently scraped twice, on the last occasion also touched with fuming nitric acid. The whole surface is now smooth, soft, and almost normal in aspect, a degree more pink than the rest of the forehead. There can be no doubt that the rays have hastened the renovation of the epidermis. The exposures have been carried out by Drs Raeburn and Gardiner. While the rays have a stimulant action on the reproduction of epidermis, this is limited, and they have no very penetrative action on the epitheliomatous process itself. When this has penetrated beneath the skin, at best they act restrictively not curatively, and this is supported by Dr Sequeira's experience, in a case where multiple epitheliomata developed on an old standing lupus vulgaris of the face in a man of 46. He says "It is interesting to note that during the past three weeks the larger growth has increased in size although the patient has been submitted for ten minutes a day to the X-rays."[1]

Mr Alexander Miles exhibited—

(*a*) A patient after operation (gastro-enterostomy) for severe HÆMATEMESIS.

Mrs H., æt. 42, on Sunday 8th September 1901 was suddenly seized with severe hæmatemesis. Four years

[1] *Brit. Journ. of Dermatology*, Nov. 1901.

previously she had been treated by Dr Robert Stewart for dyspepsia, and the stomach, which was dilated, had been frequently washed out. She never vomited blood, nor did she exhibit any of the ordinary symptoms of gastric ulcer. After this attack she regained her normal health and remained well till the vomiting of blood began on September 8th. In the absence of Dr Stewart she was seen by Dr Jamieson. The usual methods of treatment were unsuccessful in arresting the hæmorrhage which went on more or less continuously till Tuesday afternoon. As the patient's life was endangered by the great loss of blood Dr Jamieson advised that an operation should be performed in the hope of arresting it.

As the patient's surroundings were unsuitable, and as she lived close to the Infirmary, we decided to remove her there. She was admitted to Mr Cotterill's ward—in charge of which I happened to be at the time—at 9 P.M. on Tuesday 10th September.

On admission the patient was blanched and cold, and the pulse could scarcely be detected at the wrist. She tossed her arms about, threw off the bed-clothes from her chest, and exhibited the other symptoms of "air-hunger" in a characteristic degree. She continued to vomit blood after admission.

Chloroform was administered, and the abdomen was opened in the middle line above the umbilicus. On examining the stomach a densely indurated ulcer about the size of a five-shilling piece was found close to the pylorus. It extended to the lesser curvature, and fully two-thirds of the way to the greater curvature. It was therefore impossible to invaginate it without great risk of occluding the pyloric orifice, and the condition of the patient did not justify an attempt being made to excise the ulcer. It was therefore decided to perform a posterior gastro-enterostomy. After opening the stomach its interior was explored with the finger, and the site and size of the ulcer were confirmed. No definite bleeding point was recognised. The communication between the stomach and intestine was then completed with silk stitches. Before closing the abdomen about two pints of saline fluid was introduced into the peritoneal cavity.

During the first twenty-four hours (11th September) after operation, the patient received rectal injections of saline fluid (8 ounces) every four hours, and frequent nutrient enemata.

These were all retained. The foot of the bed was raised. Although she continued to vomit bile-stained mucus at intervals, there was no further loss of blood. Flatus was passed in the evening.

On the 12th the patient was better, but was still sick occasionally. This became less frequent after the foot of the bed was lowered. As it seemed possible that the sickness might be due to regurgitation from the small intestine into the stomach the head of the bed was raised. After this was done the vomiting ceased. The bowels moved slightly about midnight.

On the 13th, beef-tea and peptonised milk were given by the mouth.

From this time onwards the patient progressed satisfactorily. The wound was dressed on the ninth day and the stitches removed. Primary union took place. She was up on the twenty-first day, and left the hospital on the twenty-ninth day. Since going home on the 7th October she has remained well, and her health has greatly improved.

(*b*) A patient after operation for INTESTINAL OBSTRUCTION due to tuberculous peritonitis; subsequent development of TUBERCULOUS PLEURISY, which was treated by drainage.

John L., aged 16, admitted to Leith Hospital on 19th August 1898 suffering from intestinal obstruction. He had enjoyed good health till three weeks before admission, although he had never been robust. Three weeks before admission, after returning from a picnic, he was sick and vomited. He had some slight pains all over the abdomen. For about a week the vomiting continued at frequent intervals, and he was unable to attend to his work. The movements of the bowels were unsatisfactory. The next week he resumed his work, and had no further trouble till three days before admission.

On that day (16th August) he was suddenly seized with pain in the abdomen. The pain was general and constant, but was not severe. He vomited everything he took by the mouth. The bowels did not move and no flatus was passed. As these symptoms persisted for three days and became aggravated he was sent into hospital.

On admission the temperature was 97° F., the pulse 100—of low tension, but good volume.

The abdominal walls were retracted and did not move with respiration. Peristalsis was visible in the middle of the

abdomen and in both flanks, and suggested movements of both large and small intestine. No definite swelling could be palpated. In the right iliac region, and in the line of the descending colon marked gurgling was elicited on palpation. The abdomen was uniformly tender all over. The rectum was empty and "ballooned." Several enemata were administered without result.

At 8.30 P.M. the abdomen was opened in the middle line below the umbilicus. The small intestine exposed was distended, deeply congested and thickly-studded with miliary tubercles. The parietal peritoneum was also covered with tubercle nodules varying in size from a pin's head to a horse bean. On exploring the abdomen a fibrous band was found constricting the small intestine a little to the right of the umbilicus. The collapsed bowel beyond the constriction was lying at right angles to the distended bowel, and the two loops were united by comparatively recent adhesions for about an inch. After division of the band and separation of the adhesions the intestine contents instantly passed into the collapsed bowel. The whole of the peritoneum was found to be covered with tuberculous nodules, but no further adhesions could be detected. There was very little fluid in the peritoneal cavity. A Keith's tube was introduced into the pelvis, and the abdomen closed.

The patient was restless during the night. In the morning (20th) the temperature was normal, the pulse 110. There was no vomiting, but the bowels had not moved, even with the aid of an enema.

The tube was removed on the 21st. For the next two days the general condition improved but the bowels did not act. On the following day, however (24th), they moved very freely, and the patient was greatly relieved. The stitches were removed on the tenth day after the operation. For the next five weeks the patient continued to improve. The bowels were not very regular but were easily moved by castor oil or Henry's solution. A month after the operation he was allowed up.

Five weeks after the operation (23rd September) the temperature began to rise, the patient did not feel so well, and complained of pain in the epigastrum and in the right side. Nothing abnormal was found on examining the chest. The temperature continued irregular—99° to 102° F., the pulse

110 to 124, and the respirations 22 to 28, for some days and the pain in the right side of the chest became more severe. There was a sharp catching pain on inspiration, and a short dry cough. Loud rubbing and creaking friction was heard over the front of the right side. On examining the back it was found that the right base was absolutely dull, with diminished resonance and absence of fremitus and breath sounds. On the 3rd October an exploratory puncture was made, and some clear fluid withdrawn from the right pleura. During the next few days the effusion increased. On the 9th October a small quantity of fluid was withdrawn.

On the 11th October (eighteen days after the temperature began to rise) a portion of the eighth rib was excised in the posterior axillary line. On opening the pleura and exploring with the finger it was found that numerous recent adhesions had formed between the chest wall and the lung. A quantity of clear fluid with some flakes escaped. The pleura was closed with cat-gut sutures, and the external wound sutured without drainage. It healed by first intention. During the next few weeks the patient's general condition improved, but the temperature still remained irregular—99° to 101·5° F. The physical signs gradually cleared up, and the patient slowly recovered. On December 6th he was discharged well, having gained a stone in weight since the operation on his chest. He resumed his work as a wire-weaver in the course of a few weeks. During the last three years he has enjoyed excellent health. He has been able to attend regularly to his work, and has also engaged in athletic exercises.

(*c*) A patient after EXCISION OF THE RECTUM by Kraske's method.

James D., æt. 52, a labourer, was admitted to Leith Hospital on 7th September 1901, with the history that during the previous six months he had had increasing difficulty with his bowels. He first noticed that he had to strain unduly at stool, and that the motions were narrow and flattened—"like a piece of tape." They were also streaked with blood. A month later he developed a sensation as if there was a "lump," permanently in the rectum. He had a constant desire to empty the bowel, and had to make the attempt every hour or oftener, but in spite of severe straining he only succeeded in passing a little blood and mucus. Some time later he developed

griping pains across the lower part of the abdomen, and these pains became more frequent and more severe as time went on. Three months after the onset of his illness he began to have increased frequency of micturition and required to strain to empty the bladder. The stream, he says, became smaller, and he had a peculiar cold feeling and a sickening pain after making water. He lost nearly 2 stones in weight. No history of syphilis could be obtained, and he had always enjoyed good health.

On rectal examination a tight stricture was found within an inch and a half of the anus. It admitted only the tip of the finger. The edges were hard and ulcerated. The rectum was movable, except anteriorly where it appeared to be attached to the prostate gland.

On 12th September 1901, a vertical incision was made from the middle of the sacrum to the anus. The coccyx and lower part of the sacrum were removed. The rectum was exposed and isolated, clamped above the tumour and cut across. The peritoneum was opened in clearing the bowel. It was subsequently stitched with silk. The rectum was dissected out down to the anus. It was found to be adherent to the prostate, but the disease did not apparently infiltrate that gland. The cut end of the bowel was stitched to the upper angle of the wound, and the rest of the wound was loosely sutured. Iodoform gauze packing was introduced between the sutures.

The patient's recovery was only interrupted by an attack of retention of urine on the fortieth day after the operation. This could not be accounted for, and was relieved by the use of the catheter. It did not recur. The patient has gained 1 stone 6 lbs. since he got up. He has not complete control of the bowels, but is aware when the bowels are about to move, and so long as the motions are solid he can keep himself comfortable and clean.

[A plastic operation was subsequently performed. The bowel was brought down to the sphincter and the patient regained control of the bowels.]

4. *Dr W. G. Sym* exhibited a patient, a man of 67, in whose case he had performed double excision of the lachrymal sac. The patient had long suffered much annoyance from the continual discharge of tears and muco-pus both from the con-

junctivæ and from the fistula which was present on each side. As the ordinary method of treatment by probing and re-establishing the normal channel could not be expected to succeed in this case, and as the patient had a ripe cataract in one eye requiring extraction, it was decided to remove the sac entirely and then to attack the cataract. Since at the time of removal of the sac a bacteriological examination proved the presence of large numbers of pyogenic organisms, Dr Sym waited a month to allow the conjunctiva to return to a more normal condition, and then extracted the lens: a second examination at this time showed the conjunctiva to be sterile. Whereas an operation for the removal of the lens is extremely apt to be followed by suppuration in presence of a lachrymal fistula or inflammation, this patient escaped all this danger and healed up quickly and soundly. So far from his being annoyed by tears now running over the cheek, the cessation of the continual irritation of the inflamed area at the inner canthus had reduced the flow so much, that evaporation was sufficient to remove the secretion, and the patient was perfectly comfortable. The cosmetic result was also entirely satisfactory.

5. *Mr H. J. Stiles* exhibited—

(*a*) A boy, aged 6½ years, after operation for RECURRENT TUBERCLE and STRICTURE following amputation of the penis for tuberculous disease of the glans.

The patient presented himself at hospital in July last with enlargement and deeply excavated ulceration of the glans penis involving the meatus. The glands in the groin were only slightly enlarged.

As local treatment produced no benefit the penis was amputated. The boy returned to hospital three weeks ago with an aggravated stricture, the result of recurrence of the tubercle in the stump.

Mr Stiles excised the tubercular and cicatricial tissues around the stump, split the scrotum, and reamputated the penis at its root. The corpus spongiosum was dissected back as far as the perinæum, and the part in front of the bulb was removed; the bulb itself was then divided longitudinally on its ventral surface and the edges united to the posterior part of the perineal wound about 1½ inches in front of the anus. The remainder of the wound was closed and infiltration of urine

prevented by the introduction of a catheter into the bladder and the use of Mr Cathcart's "sprengel pump."

Mr Stiles pointed out that it would be desirable to remove the testicles, but thought that this should not be done until a few years after puberty. As regards the cause of the condition it should be mentioned that the boy had been circumcised when a child, but that the glans and prepuce did not become diseased until three years later.

(*b*) A child, aged 14 months, after operation for CONGENITAL STRICTURE OF THE ANUS. The stricture only admitted a No. 6 catheter. The usual operation was done, viz., the removal of skin around the orifice along with separation of the mucous membrane and the suturing of it to the edges of the skin wound. The interest of the case lay in the fact that five plum-stones and one shirt-button were removed from the rectum.

(*c*) Four cases showing the results of treatment of CONGENITAL WRY-NECK by the "open operation."

The patients had all been operated upon twelve to eighteen months ago. In each of them a very satisfactory result was obtained. Mr Stiles drew attention to the importance of dividing all the clavicular, as well as the sternal, fibres of the muscle in addition to all the fascial bands in front of the depressor muscles of the hyoid bone and the outer part of the internal jugular vein. He preferred the transverse to a vertical incision, as the former gave better access to the deeper structures and the resulting cicatrix was less evident. In Mr Stiles' opinion it was quite necessary to excise the lower two-thirds of the sterno-mastoid muscle as recommended by Mikulicz. If the simple open division be done thoroughly, a perfectly satisfactory result is obtained without the subsequent use of any apparatus or gymnastic exercises.

6. *Mr Alexis Thomson* exhibited a patient the pyloric portion of whose stomach he had removed for cancer three and a half years ago.

The patient, a married woman, was then aged 49, and was seen in consultation with Dr John Steven and Dr Murdoch Brown. Nine months before, she began to suffer from pain and discomfort coming on about one hour after meals. During fasting she was occasionally sick and brought up a small

quantity of sour watery fluid. Two months before, a tumour was discovered above and to the right of the umbilicus. She was very constipated and had lost flesh.

The tumour was found to be about the size of an orange, very freely movable, and hard and nodular on the surface. There was no free hydrochloric acid in the gastric contents. The diagnosis was made of pyloric cancer, and it was proposed to remove it. There being no evidence of pyloric obstruction there was no indication for gastro-enterostomy.

The operation was performed on the 10th July 1898 by Kocher's method, the junction of the duodenum and stomach being made with a ⅞-inch Murphy button. The only adhesions were between the stomach and great omentum. There were several enlarged glands along both curvatures; these were removed along with the tumour and were found to be free from cancer. The tumour was about the size of an adult male fist, and was chiefly composed of soft lobulated masses projecting into the interior of the stomach. The pylorus admitted the little finger. Microscopical examination showed it to be a columnar epithelioma. The patient made an uninterrupted recovery and passed the button on the ninth day.

She has gained four stone since the operation, is able to eat everything without the slighest discomfort, and leads a most active life.

7. *Mr F. M. Caird* exhibited a girl, æt. 14, who suffered from a CONGENITAL DEFORMITY OF THE LEFT SHOULDER GIRDLE, consisting in the development of a plate of bone which lay between the scapular and spinous processes of the vertebræ. There was an associated condition of elevation of the left shoulder and lateral curvature.

The bone had been excised whereby the mobility of the shoulder was increased. The case was illustrated by photographs, by the preparation removed, and by reference to three similar cases reported by Messrs Willett and Walsham (Medico-Chirurgical Transactions, vols. lx. and lxvi.) and Hutchinson (Transactions Pathological Society of London, vol. xlv.).

II. Exhibition of Pathological Specimens

1. *Mr Alexander Miles* exhibited—

(*a*) RECTUM REMOVED FOR CARCINOMA by Kraske's operation.

(*b*) PREPUTIAL CALCULI.

(*c*) A series of specimens and stereoscopic photographs illustrative of injuries of the spine.

2. *Mr F. M. Caird* exhibited portion of the transverse colon and omentum from a woman, æt. 68, removed for ANNULAR CARCINOMA. Primary resection and end to end suture were practised with success, as a palliative operation to avoid a threatening obstruction. There was extensive glandular infection.

Meeting IV.—January 15, 1902

JAMES ANDREW, M.D., F.R.C.P.Ed., *Vice-President, and, subsequently,* JAMES RITCHIE, M.D., F.R.C.S. and P. Ed., *Vice-President, in the Chair*

I. ELECTION OF MEMBER

William Robertson, M.D., D.P.H., 11 Denham Green Terrace, was elected an Ordinary Member of the Society.

II. EXHIBITION OF PATIENTS

1. *Dr Byrom Bramwell* exhibited two cases of SYRINGOMYELIA.

(*a*) *The first case* was that of a young man, aged 17, a saddler's apprentice, who was admitted to the Edinburgh Royal Infirmary on 9th December 1901, complaining of weakness and muscular wasting in the left hand and forearm.

On examination, the case was found to be a highly typical and characteristic case of syringomyelia.

The patient was remarkably thick-set and stumpy in build, with big hands and feet. As an infant he had had "fits." Since childhood he had been troubled with nocturnal incontinence of urine. In 1897, his left hip and leg became painful; the pain continued for a year. The left leg is now an inch shorter than the right, and the patient walks with a limp. Mr Alexis Thomson, who has kindly examined the hip, thinks that the disease of the hip joint was tubercular and not the result of the syringomyelia. Two years and nine months ago—when the patient first became an apprentice sadler—some inflamed swellings and blisters formed on the palms and on some of the fingers; these swellings were, the patient stated, like whitlows;

they were, however, quite painless. A year ago he noticed that his left hand was weak and beginning to waste.

The small muscles of the left hand and some of the muscles of the left forearm are markedly wasted. The hand presents the "bird-claw" appearance.

The left pupil is much smaller than the right; the left palpebral fissure is narrower than the right; and the left eye is less prominent than the right.

The knee-jerks and Achilles-jerks are markedly exaggerated, especially on the right side; ankle-clonus is present in both legs, especially in the left leg; and there is a double extensor response.

Sensibility to touch and pain are normal all over the body. The patient is unable to feel heat and cold over the arms, neck, and upper part of the thorax (back and front); there is also some impairment of the temperature sense from the level of the 6th costal cartilage down to the umbilicus, and on the inner side of the left thigh and leg, immediately above and below the knee.

There was no pain in the back, neck or arms.

The sweat secretion did not seem to be affected or different on the two sides of the head and face.

(*b*) *The second case* was that of a woman, aged 30, single, a farm-servant, who was admitted to the Edinburgh Royal Infirmary in December last, under the care of Professor Annandale, on account of an ulcer on the foot, and was transferred to Dr Bramwell's care on the 28th December 1901.

The patient had enjoyed good health till a year ago. Painless sores then developed on both hands and on the left foot without any apparent cause; they had from time to time healed. Three weeks before admission to hospital, she began to lose power in the left arm.

On examination, the patient was found to be a strongly built, somewhat masculine-looking woman, with massive hands and feet. There were several sores on the fingers and thumbs of both hands and on the sole of the left foot; these sores were almost entirely painless.

The muscles of the right arm, more particularly the biceps, supraspinatus and infraspinatus muscles, were markedly atrophied; the small muscles of the hands were unaffected. The left trapezius was somewhat smaller and softer than the right.

The deep reflexes were greatly exaggerated, both in the upper and lower extremities; ankle-clonus was present on both sides; the jaw-jerk was markedly exaggerated. The plantar reflex showed double flexion.

Sensibility to touch was unimpaired all over the body. Sensibility to pain was very slightly affected. Sensibility to heat and cold was very markedly impaired over the arms, thorax, trunk (back and front), thighs (back and front), neck (back and front), and over a considerable part of the face. Over the legs and feet and scalp, heat and cold are normally perceived; heat and cold could also be normally perceived in the tongue.

The right pupil was slightly larger than the left. There was no pain in the back.

The case was of great interest because of the widespread character of the sensory loss to heat and cold; the fact that there was very little impairment of the pain sense; the markedly exaggerated condition of the deep reflexes, including the jaw jerk, while the plantar reflex was flexion and not extension; the marked atrophy of the muscles of the upper arm, of the shoulder girdle, and of the trapezius; and the trophic lesions on the hands and left foot.

2. *Mr H. J. Stiles* exhibited—

(*a*) A boy after operation for PUNCTURED WOUND OF BRACHIAL ARTERY. While climbing a railing the patient was pulled down by another boy. A spike of the railing penetrated the arm close to the axilla. He was brought at once to Hospital, where he arrived in a fainting condition, with his clothes soaked with blood. There was a wound half an inch in length, transverse to the axis of the arm, and exactly over the line of the upper part of the brachial artery. The bleeding had ceased. There was no pulse at the wrist on the injured side, whereas that at the opposite wrist could be distinctly felt. On enlarging the wound it was found that the brachial artery had been punctured opposite the origin of the superior profunda. A clot projected from the orifice, hence the arrest of hæmorrhage. The vessel was ligatured above and below the puncture, and a third ligature was applied to the superior profunda. The wounded portion of the vessel, along with the origin of the superior profunda, was then resected between the ligatures. Some of the fibres of the coraco-brachialis muscle were ruptured.

The basilic vein and the nerves were uninjured. Mr Stiles thought the case was of interest as showing the importance of carefully investigating punctured wounds in the neighbourhood of important vessels and nerves. Had the wound not been opened up the boy would have had further and dangerous hæmorrhage when reaction set in.

(*b*) A girl after second operation (excision) for PLEXIFORM ANGIOMA OF SCALP. The patient was exhibited before the Society a month ago, a fortnight after the first operation, which consisted in the ligation of twelve vessels of the scalp. The effect of this operation was almost entirely to obliterate the pulsation of the tumour. The second operation, viz., excision of the tumour, was performed by reflecting it along with the scalp by means of a horse-shoe incision encircling two-thirds of its circumference. The dilated vessels were then dissected off the deep surface of the flap. An elastic tourniquet, placed round the circumference of the cranium, very effectually arrested the hæmorrhage, which, however, was very copious on the tourniquet being removed. The free bleeding from the cut edges of the scalp was arrested by the introduction of a series of interrupted and firmly drawn mattress sutures, followed by the application of a firm compress dressing kept in position with an elastic bandage. The result was a complete cure of the aneurismal condition. Without previous ligation of the vessels feeding the tumour, the excision would have been attended with grave risk from loss of blood.

3. *Dr William Elder* exhibited a case of a man with TRANSPOSITION OF VISCERA. The patient, a man over 30 years of age, was admitted to Leith Hospital with indigestion and palpitation. On examining the heart it was found that the apex beat was to the right side of the sternum, about 2 inches below and 1 inch internal to the right nipple line.

His liver was on the left side and his spleen on the right. This was made out by percussing, but the Rœntgen rays showed it also very distinctly. The cardiac end of the stomach was towards the right. In order to ascertain whether the descending colon was on the right or left side a rectal examination was made, when the sigmoid flexure of the colon was found to be on the right side. The appendix, therefore, in this case would be on the left side, an interesting fact in connection with the surgical treatment of appendicitis. The case was therefore

one of complete transposition of all the thoracic and abdominal viscera. The patient was a right-handed man. It is interesting in this connection to remember that the nervous system is developed from the epiblast.

Before admission the patient had been treated for palpitation, by having prescribed for him a small blister over the apex of the heart, and he still bears the mark of the blister applied over the usual position of the apex on the left side. Moral—Always ascertain the position of the organ before treating it.

4. *Dr C. W. MacGillivray* exhibited a little girl, aged 4½, upon whom he had operated on Tuesday, December 3rd, for INTESTINAL OBSTRUCTION. The history of the case was, that on various occasions since the child was a year old she had complained of abdominal pain of a passing character; this was attributed to the presence of an inguinal hernia, for which she had worn a truss.

On Wednesday, November 27th, she was suddenly seized with severe griping pain in the abdomen at the level of the umbilicus. A large dose of castor oil was given by medical advice; this acted efficiently, and on the following morning she was free from pain and able to be out of bed and walking about the house.

On Friday, November 29th, the pains returned, another dose of castor oil caused the bowels to act, but the pain remained unrelieved, and from that time until the date of operation on the following Tuesday there was no further action of the bowels, notwithstanding further doses of castor oil and enemata. The pains continuing she commenced vomiting on Sunday, and the abdomen became distended. On Tuesday, the day of admission, she became collapsed, and vomited dark fluid with a fæcal odour, and was unable to pass water; she was therefore sent to the Infirmary. On admission the pulse was 120, and weak. The temperature 97°. The knees were drawn up, and the child was constantly crying and moaning; the complexion was pale.

The abdomen was distended, especially in the middle, and some fluid could be made out in the flanks. General pain was complained of, worst in the region of the umbilicus. Nothing abnormal could be made out in the inguinal region. The rectum was ballooned, and contained some hard fæcal knots.

Chloroform was administered, and the lower bowel cleared out by means of an enema.

An incision was made between the umbilicus and symphysis pubis, and the abdomen opened. A quantity of dark-coloured serum escaped. The small intestines were reddened and distended. On tracing them down, an inflammatory area was reached. At the lower end of the ileum, about 2 or 3 inches above the ileo-cæcal valve, the intestine was bound down by several adhesions passing from the parietal wall of the abdomen and omentum to a hard irregular mass, about the size of a tangerine orange, situated retroperitoneally. Over the vena cava, the large intestine was empty and collapsed. The bands were divided and tied after clamping with forceps, the obstruction was at once relieved, and the large intestine became distended. On examining the mass, it was found to be inflamed, soft in places, and formed of retroperitoneal glands, these were incised, and a quantity of tuberculous pus and cheesy matter escaped. As from these adhesions it was impossible to excise them, they were thoroughly scraped out, the interior rubbed with pure carbolic acid and sterilized iodoform, and packed with a strip of iodoform gauze, the end being brought out at the incision. The blood-stained serum having been sponged out of Douglas' pouch, two of Keith's glass tubes were introduced and the rest of the wound sutured. No trace of enlargement of the internal ring or sign of past inguinal hernia was discovered. The bowels acted the next day, and the child never had a bad symptom, one of the tubes being removed the day after the operation, the gauze drain on the third day, and the other tube on the fourth; the wound thus healing uneventfully.

One or two similar cases have been recorded, but, in my opinion, the case is sufficiently rare to warrant me in bringing it before your notice.

III. Exhibition of Pathological Specimens

1. *Mr H. J. Stiles* exhibited—

(*a*) Portion of BRACHIAL ARTERY from patient exhibited.

(*b*) MULTILOCULAR CYSTIC TUMOUR OF MESENTERY removed, along with 6 inches of small intestine, from a child, aged 1 year and 8 months. The tumour, which was probably

congenital, weighed 1¾ lbs., and was situated at the intestinal attachment of the ileac portion of the mesentery. It consisted of four lobes, two of which had become strangulated by torsion, which had also occasioned the acute intestinal obstruction for which the child was operated on. A portion of the ileum was inseparably attached to the tumour, and had, therefore, to be removed along with it. The obstruction was of six days' duration. There was fæcal vomiting at the time of operation, and the child was very collapsed. Death occurred a few hours after operation.

2. *Dr Alexander Bruce* exhibited a series of six sections through an aortic aneurism, prepared so as to show their relations to the other thoracic viscera. The body had been previously injected through the carotid arteries and innominate veins with a 50 per cent. solution of formalin twelve hours before the post-mortem examination. The thoracic contents, along with the anterior chest wall, were removed *en bloc.* The further hardening in formalin was continued for one week, and sections were made through each intercostal space, the relations of parts being preserved absolutely. In cases where the organs were less firm, it would be advisable to freeze them before making the final sections. The method is particularly suitable for preparing specimens for demonstration or teaching purposes.

3. *Mr J. M. Cotterill* exhibited—

(*a*) FŒTUS AND SAC, from a case of ruptured (intraperitoneal) tubal gestation.

Mrs L., aged 28, had a child six years before; inflammation of uterus four years ago; unwell six weeks ago for one day, and again one week ago; on each occasion severe pain in left lower abdominal segment.

Last night severe pain and collapse. On admission to the Infirmary, the abdomen was at once opened: a large quantity of blood found in the abdominal cavity, together with ruptured sac and escaped fœtus. Left tube was dilated and ruptured, so it was removed; the ovary was left. On third day she passed a cast of the uterus *per vaginam.* Some hæmorrhage *p.v.* and through the abdominal wound for a few days. Wound healed in ten days. Result: cure.

(*b*) ANEURISM OF POSTERIOR ULNAR RECURRENT ARTERY.

M. W., female, aged 26.

Cause of aneurism unknown; duration, fourteen months; symptoms, local pain, and tingling in index and middle fingers and occasionally in thumb.

A pulsating tumour appeared six months after onset of pain on ulnar side of left elbow, just above the joint.

Treatment, tumour excised and found full of laminated clot.

Aneurism in this position is very rare, and no cause could be found.

Result: cure.

(*c*) Several SEMI-LUNAR CARTILAGES removed from the knee-joint in cases of INTERNAL DERANGEMENT OF THE KNEE-JOINT. Specimens show that the cartilage is very often split longitudinally and also in most cases transversely also, the torn edge tending to find its way towards the centre of the joint and thus causing locking in extension.

(*d*) Specimens from a case of fracture of the sternum and skull, and dislocation between the 5th and 6th cervical vertebræ.

F. B., male, aged 29, fell 30 feet, back downwards, his head being then thrown violently forwards by its striking some iron plates in the course of the fall.

On admission, shortly after accident, the patient was collapsed; breathing mainly diaphragmatic. Pulse and temperature rose from 68 and 97° to 150 and 102° respectively in four hours. He died with a very high temperature, 106°, some twenty-one hours after admission, never having regained consciousness. There was a gutter fracture of the vertex, a double fracture of the sternum, apparently from doubling up of the neck and impact of the chin on the sternum and dislocation of the spine, without fracture. The cord was compressed. A large extravasation of blood was found in front of the pericardium.

(*e*) An hour-glass contraction of stomach only admitting the little finger. There were two ulcers in the stomach, one in each sac; one of these had ruptured and had caused the patient's death.

(*f*) KIDNEY FROM A CASE OF PROFUSE HÆMATURIA.

G. R., male, aged 56, previously in perfect health, was suddenly seized with profuse hæmaturia three days before death.

The bladder was firmly filled with clots, which were washed out through a large glass tube introduced into the bladder by

the perineum. The bladder rapidly filled with clots again. Suppression of urine supervened, which proved fatal on third day.

P.M.—Slight interstitial nephritis in both kidneys. Bleeding arose from a small vascular area (papilloma? sarcoma?) of the size of a pea in the left kidney. The case is still under examination to determine its exact histological nature.

5. *Dr C. W. Macgillivray* exhibited a PAPILLOMA OF RECTUM the size of a large tangerine orange.

Removed on the 27th November last from R. S., 38, boiler-maker, who had complained for six years past of bleeding from the bowel during defæcation, and the occasional protrusion of a soft mass during the last two years.

There was no pain at any time except when the tumour was not at once put back beyond the sphincter after it had come down. The mass was spongy and friable, and pieces of it had been picked off by the patient from time to time.

In operating, Dr MacGillivray stretched the sphincter and used forceps and ligatures for the base of the tumour, which was then excised.

The situation of the tumour was on the posterior wall of rectum, 3½ inches from the anal orifice.

IV. Exhibition of Apparatus

W. Leslie Mackenzie, M.A., M.D., D.P.H., Medical Inspector to the Local Government Board for Scotland, exhibited a simple and portable spray pump for disinfection, of which the following is a description:

My problem was to find a portable, facile, and inexpensive spray pump. For such a pump the demand has been obvious ever since disinfection by spray became a common method in Britain. By portable, I mean light enough to be carried easily on a bicycle, which is a usual mode of transit for county sanitary inspectors or disinfecting officers. For the town areas portability is not of the same urgency, because several modes of conveyance are usually available; but even in towns, portability means a saving of labour, money, and time. By facile, I mean capable of being worked by a single man without inducing such rapid fatigue as might tempt him to

scamp his work. By inexpensive, I mean cheap enough to be within the ordinarily permissible outlays of minor local authorities, or hospital committees, or School Boards, or model lodging-house keepers, or hall owners, or owners of private hospitals, or, generally, of all such as would readily use a simple disinfecting apparatus if they had it.

In the spray pumps shown in the photographs, the three conditions are, I think, reasonably fulfilled. As to portability, the small pump weighs 5 lbs., the larger (the bulb, by the way, is not essential) weighs under 6 lbs.; with crosspiece added the weight does not exceed 5½ lbs. or 6½ lbs. This load any boy can manage. As to facility, either pump can be worked with ease by one hand. To keep the spray nozzle playing requires, in the heavier pump, only some three up strokes and three down strokes per minute, or an equivalent of this in short strokes; in the lighter pump perhaps one or two more strokes are required. In either pump, short — say, 2-inch—strokes to the number of some twenty-five per minute are enough. Twenty-five short strokes or six full strokes per minute, that is one every two or one every ten seconds approximately, cannot be regarded as hard work. As to inexpensiveness, the prices will be found to fulfil the indications I have mentioned.

How are these conditions secured? By the adaptation of a continuous current garden pump to the particular purposes of spray disinfection of surfaces. The essential pieces are three: a pump with an adjustable stirrup, a tube, partly flexible, partly rigid, and a spray-forming nozzle.

The Pump

The pump is a strong brass pump, about 1⅛ inch in diameter, about 2 feet in length, provided with a ball-valve inlet at the bottom, a ball-valve piston, a hollow piston-rod, and an outlet near the top. The pump is, in fact, a well-known force pump with an air chamber in the piston rod to keep the flow perfectly continuous over the "dead" points of up and down stroke. Continuity of flow with intermittent stroke could be secured by the elasticity of the flexible tube alone, but the life of such a tube would be shorter, and the tube itself would necessarily be weaker. The continuous

current in this pump is independent of the elasticity of the tube, which, consequently, may be made very strong and very inelastic. Further, an intermittent spray could be obtained from an ordinary garden syringe, but the value of the instrument for ordinary disinfecting work would be much less. Continuity of spray, therefore, is essential. In this pump, both upstroke and downstroke yield a current; both on upstroke and on downstroke the air locked in the piston is compressed; both on upstroke and on downstroke the recoil of the air cushion steadies the flow and maintains it in perfect continuity. As the pump inlet is large relatively to the pin-hole outlet of the spray nozzle, the strokes required to keep up the flow are very few, and the liquid can be delivered under very high pressure, the spray being finer when the pressure is high. The pressure, however, required for ordinary work is very little. The spray begins to play with the second stroke. No adjustment of stop-cocks, or indeed of anything, is necessary. The pump, once fitted with tube and nozzle, yields its spray. What, however, is essential is that the passages be kept clear, and the piston and piston-rod well oiled. The mechanical knowledge necessary to work the pump should be within the capacity of any man with two hands and a foot.

The Tube

The tube is partly flexible, partly rigid. The flexible part is simply a piece of strong bicycle pump (or inflating pump) rubber tubing; rather, I should say it is three pieces jointed to make a length of 7 feet. Needless to add, this tube stands very high pressure; it is light, and it is as flexible as the case requires. Ordinary garden-hose tubing would serve the purpose, if lightness and convenience of packing were no object. The brass part is 3 feet long; it can be unscrewed from the rubber tube, and further unscrewed into two lengths of 18 inches each. This is for convenience of packing; the two pieces of the rigid tube are inside the coils of the rubber tube. The rubber tube is somewhat thicker, but admits of the same or an equivalent mode of coiling. A thin brass tube, however, is difficult to grasp firmly for any length of time. Accordingly at the junction of brass and rubber tubes, I have had a thick wooden handpiece adjusted. With this handpiece, the brass

tube can be directed with perfect nicety, and the weight of the whole tube—flexible and rigid—even when charged with liquid is trifling. These points are all important in practice, the raised arm being very readily fatigued.

On the principle of the sweep's brush, the brass tube can be lengthened by the intercalation of extra 18-inch lengths. For high ceilings this is important. The tube, when thus lengthened to 6 feet—that is, by adding two extra lengths—is still easily manipulated. Few ceilings are more than 13 feet high. If we assume the average man's height to be 5½ feet, and his reach with stretched arm 6½ feet, then, with a 6-foot brass tube he will be able to come within 6 inches of a 13-foot ceiling; but if he come within a foot, that is enough. He can, therefore, without scaffolding of any kind, spray a high ceiling. The pump seems to work rather better with the longer tube than with the shorter. In buildings, such as halls, where ceilings are very high, stronger and longer tubes could be adapted to any reasonable height. The chief labour in spraying such places is due to the provision of scaffolding, shifting of steps, and the like. With the "sweep's-brush handle" tube, all this is avoidable.

The Nozzle

The spray-forming nozzle shown in the photograph is one in common use for spraying delicate plants. The pump usually associated with it is a low-pressure air-pump. On attaching the nozzle to the pumps described above, I found that it yielded a copious, delicate, and constant spray. The nozzle itself consists of two parts, which are easily unscrewed for cleaning when necessary. As indicated already, the energy necessary to produce the spray is very small. The nozzle is designed to give a spray of a certain tenuity; but one nozzle can, in a few seconds, be substituted for another, and nozzles can be made in various grades—from coarse to fine. For all ordinary purposes the spray produced by the nozzle shown is perfectly satisfactory. The mistake commonly made is to use too fine a spray, in case wall papers or other surfaces may be destroyed. Elsewhere I have shown that this fear is due simply to *a priori* ideas about wetted surfaces. The vast majority of walls—papered, sized, white-washed, varnished, painted, etc.—can be thoroughly wetted without suffering any damage, provided

the wetting proceeds from below upwards, not from above downwards.

Three-nozzle Crosspiece

For ordinary house disinfection a single nozzle is enough; but where wall surfaces are very large, as in hospitals or halls or schools, the labour may be much reduced by the three-nozzle crosspiece. For convenience of packing I have had the crosspiece made in detachable pieces of 18 inches each (like the pieces of the handling tube), and I have had attached three nozzles, one at each extremity and one in the centre. The capacity of the pump, I find, is more than sufficient to make all three nozzles play uniformly. The spray clouds produced just intermix at about 1 foot from the nozzles, and the combination yields a spray that may be made to wet an area of about 6 feet by 3 feet at a time. With a gentle waving motion the area can be much extended. As the amount of liquid discharged is at least three times that discharged by a single nozzle, a large area can be covered very rapidly. A ward wall 48 feet long could be taken in eight vertical sections. The spray could be moved upwards at the rate of, say, 1 foot a second. A section 13 feet high would thus take thirteen seconds, or say fifteen. Let this be doubled for contingencies, and quadrupled for shifting of plant. Each section would then take a minute. The eight sections would take eight minutes, or say ten. If the opposite wall take other ten minutes, the ends five each, and the ceiling (say 25 feet broad) twenty, the total time would still be only fifty minutes, a small allowance for a ward of 15,600 cubic feet, or approximately eight beds at 2000 cubic feet per bed. Where two persons are available a ward could easily be sprayed in this time or less; and where formalin, or other solution of formaldehyde is used, time is not unimportant to the comfort of the operators.

For these and similar reasons the three-nozzle crosspiece, which is still easily manipulated by one hand, should, I think, result in economy of time and labour. The extension of the number of nozzles is limited only by convenience and the capacity of the pump. For habitual use the crosspiece should be fitted with a stronger and heavier handling tube, but for the occasional use of the crosspiece the handling tube shown is sufficiently strong.

The Stirrup

The vessel used for mixing the disinfectant may be an ordinary milkpail or pitcher or basin. A vessel of special capacity could easily be designed, but every house has something that will suit. To keep the pump rigid in the vessel a Z-shaped stirrup has been fitted on the cylinder. The upper arm of the Z is high enough to clear the edge of an ordinary milk pail, and if a higher vessel is used a block under the lower arm of the Z will make this equally suitable. On this lower arm the foot is placed. With the upstroke, foot and hand pull in opposite directions without moving the cylinder.

Preparation of Disinfectant

The disinfecting officer should always be provided with a measure for the disinfectant to be used. A measure for the quantity of water, however, is likely to be clumsy. The pump itself may be used as a substitute—so many full strokes (with nozzle removed) yielding, say, a gallon. There need thus never be any chance work in making up the proper strength of disinfectant.

Packing

The tubes are both detachable; the rubber tube can be coiled round the brass tube, or a case may be made for pump and tubes together. The pump should always be pumped clear before being packed.

Conclusion

The spray pumps shown in the photographs have been made by Messrs Benton & Stone, brassfounders, Bracebridge Street, Birmingham, who have carried out in a practical model all the suggestions I made to them for the adaptation of their garden sprays to the purposes of wet disinfection. In the *Sanitary Journal* for March 1897, and in *Public Health* for March and May 1900, I discussed in considerable detail the method of disinfection by spray. The pump now described will, I think, fulfil all that can be legitimately claimed for spray disinfection, and I say so in the light of five years' experience of the method in the ordinary routine work of a

medical officer of health. There are, no doubt, many varieties of spray producer in the market, and experience will continue to suggest improvements. All I claim for the spray pump described is that it is light, easily worked, and cheap.

Note.—Mr Cathcart has suggested a bamboo fishing-rod as a simple means of carrying the nozzle to various heights. A fishing-rod about 10 feet long, so adapted, was also shown. A roof some 17 to 19 feet high can thus be reached without difficulty, while one hand is engaged with the pump. The makers now provide a bamboo rod for high ceilings.

V. Demonstration

Mr C. W. Cathcart demonstrated Ramsay Smith's method of rapidly preparing Histological Specimens.

The three features which Mr Cathcart thought specially deserved attention were:

1. The adaptation of the freezing method of cutting microscopical sections to tropical climates. This was attained by embedding the tissues in cork, and using a spray of ethyl chloride as the freezing agent. (In a room, at a temperature of 60° F., Mr Cathcart had found the ether spray quite as efficient as ethyl chloride, and much cheaper.)

2. The method of cutting, which consists of a continuous raising of the screw with the left hand simultaneously with a rapid to and fro movement of the knife, without any attempt to adapt the screw at each cut. This is not only rapid, but gives exceedingly good sections, although the exact measurement of them is not attempted.

3. The method of mounting permanently sections of fresh tissues, which consists of floating out the sections in from 2% to 4% of formalin, spreading on to a slide, staining with hæmatoxylin or eosin, dehydrating with absolute alcohol, and mounting in Canada balsam. He finds that he "can cut sections at the rate of from 300 to 400 per minute, prepare and complete a stained permanent preparation within six or seven minutes from receiving the fresh tissue from the body or the operating theatre."

Mr Cathcart referred the members for complete details of the method to Dr Ramsay Smith's paper in the January issue of the *Scottish Medical and Surgical Journal.*

VI. Original Communication

A CASE OF TUMOUR OF THE LEFT PREFRONTAL LOBE REMOVED BY OPERATION

By William Elder, M.D., F.R.C.P.Edin., Physician to Leith Hospital; and Alexander Miles, M.D., F.R.C.S.Edin., Surgeon to Leith Hospital; Assistant Surgeon, Royal Infirmary, Edinburgh

The following case presents features which appear to us worthy of being recorded. In spite of the advances made in cerebral surgery in recent years a very small number of the successful operations have been performed for tumours. This is due chiefly to the fact that very few cerebral tumours, even if they can be accurately diagnosed and located, are removable. Starr has published a table of 1100 cases of cerebral tumours reported by several well-known observers which shows that only 7 per cent. were "probably removable." The difficulty in localising cerebral tumours is still very great in spite of recent advances in our knowledge of cerebral anatomy and physiology. If situated in the Rolandic areas, in any of the speech centres, or in the occipital lobes, symptoms are produced which afford great help in locating the tumour, but there are still many "latent" or "silent" regions of the brain, lesions in which give rise to no symptoms or to symptoms which are as yet not understood.

Our patient suffered from a tumour of one of those so-called "silent" regions—viz., the left prefrontal lobe—and his case illustrates the fact, which has been pointed out by *several* observers, that a tumour or other lesion in this region gives rise to a fairly definite group of symptoms. The prefrontal lobe was looked upon as a silent region from the fact that experiments—such as those of Ferrier, Horsley, and others—failed to elicit any definite motor reaction when this part of the brain was electrically stimulated. Extirpation of the prefrontal lobes in monkeys, however, gave rise to a train of symptoms which, as far as they can be compared, closely resemble those exhibited by our patient as well as by the patients in other reported cases. As these symptoms are produced by an interference with inhibition, with attention, and with judgment, which are probably the highest functions of the brain, rendering man pre-eminent amongst living creatures, it is very difficult to compare such symptoms with those exhibited by the lower animals.

Our patient, a man, aged 47 years, was admitted into Leith Hospital on October 12th, 1901. The history we obtained was that he had enjoyed good health till the May before his admission when he began to suffer from pain in the back of his head and in the small of the back and shooting pains in the legs. Soon afterwards the pain was referred to the left frontal region, and it subsequently remained localised to that part of the head. Early in his illness the left side of his forehead and face became swollen to such an extent that his left eye was closed, and while this swelling lasted the pain in the head was relieved. After about four weeks the swelling began to disappear gradually. During this time the patient was taking some medicine—probably potassium iodide—which had been prescribed for him previously at the Royal Infirmary, Edinburgh. He had occasional attacks of vomiting of the cerebral type, without relation to food or other apparent cause. He continued at his work till September 12th, on which date the term of his employment expired. For about a fortnight he was no worse, but then he became depressed, refused to leave his bed, and would not speak to his wife. He sometimes refused to take his food, although his appetite appeared to be normal. His memory became affected also, so that he would forget in a few minutes what he had been saying. He became very emotional and would begin to weep at the sight of his friends—as his wife expressed it, "he became kind o' soft." It was also a source of annoyance to his friends that he seemed to lose all sense of decency and shame and exposed his person unduly and needlessly. He suffered from incontinence of urine but had full control over his rectum. At times he appeared not to be aware where he was, and when in his own house he would say to his wife, "Let us get away from here." During the night especially he seemed to lose his bearings and did not know where he was. At this time he complained greatly of the pain in the left frontal region, and a swelling appeared over the frontal eminence. All these symptoms gradually got worse, and he was sent to Leith Hospital on October 12th, 1901.

On admission the patient lay on his back in apparent comfort. He was sleepy, dull, and apathetic, and could only be roused with difficulty by pinching or shaking him or by a sharp question. When awakened he yawned frequently. His hearing seemed to be normal. His responses to questions were correctly

expressed, but were made more slowly than was normal. He could not sustain his attention for any length of time; any subject which was brought before him, although it might attract his attention for a moment, seemed to pass from his mind very soon. As regards the affection of his memory, it appeared to be not so much a blotting-out of his past impressions as a want of power of associating memories, of comparing and contrasting them. Lack of judgment, therefore, was a marked feature of his mental condition. There was no aphasia, but there was some degree of dysarthria, which was well marked on his attempting to pronounce test words and sentences, such as "British Constitution," "truly rural," and "artillery." His reading and writing could not be tested, as he had never learned to read and to write. There was paresis, especially in the lower part of the right side of his face, and the power in the right arm, as evidenced by the grasp of the hand, was not as great as in the left side. He complained of occasional pains, which were not very severe, shooting down the front of both legs. The plantar and patellar reflexes were present but not exaggerated. There was ankle clonus. He seemed to walk easily, and, as far as could be tested, his co-ordination was not impaired. His wife stated that he had staggered on suddenly getting up out of bed, but he did not complain of giddiness. There was no pain in the left frontal region unless when the skull was percussed. An examination of the blood showed hæmoglobin 90 per cent., red blood corpuscles 4,800,000, and white corpuscles 8000. On microscopic examination of films nothing abnormal was detected. The sight of the left eye was completely lost, the eye having been disorganised by small-pox twenty-five years ago. The sight of the right eye was still good. The right pupil was slightly contracted but responded to light. Although the patient saw quite well he was not accurate in counting the number of fingers held up before him. He could name objects at sight quite well. He could not tell the time on a watch correctly, although he recognised that it was a watch and said so when asked to name it. He had no difficulty in recalling words or names. He answered questions slowly and apathetically and in such a way as to indicate that he took no interest in what he was saying. His gestures also suggested this. For example, if he was shown a watch and asked what it was, he looked at it and said, "A watch." Then

he half closed his eyes, assumed a disinterested expression, and turned his head away as if he had completed some piece of work and was now done with it. When asked his name he gave it all right, but when asked his age he said, "Sixteen." On being asked the same question repeatedly he always answered, "Sixteen." He was then asked if he was a hundred and he answered, "Yes, more than a hundred." When asked where he lived he gave the name of a street he lived in a few years previously. On being asked if he lived in S—— Street (where he really did live) he said, "Yes." When asked, "Where are you living now?" he said, "Here." Over the left frontal eminence was a small round swelling, evidently arising from the bone, in the centre of which was a soft area. It was tender on pressure. Over the right frontal region was a small depressed cicatrix the result of an abscess which had been opened three years previously in the Royal Infirmary. The tongue was slightly tremulous and flabby, moist, and very slightly coated posteriorly. It was protruded in a straight line. The teeth were bad, the breath was foul, and the bowels were regular. The abdomen was slightly tympanitic. There was no splenic or hepatic enlargement. He passed his urine and fæces in bed, but this apparently was not from want of control of his sphincters but from want of appreciation of the impropriety of doing so.

As regards the history of the patient previously to the onset of his present illness it was stated that he had always enjoyed good health. Syphilis was denied. He had been married seventeen years and his wife had had three miscarriages—at six, seven, and eight months respectively — and four living children. Three years before he had had "an abscess" opened over the right frontal region. Four years before this abscess formed he had received a blow on that region. There was no history of injury to the left side of the head. He had never been a heavy drinker or smoker.

With regard to the treatment and progress, on admission on October 12th the patient was put on light diet and given iodide of potassium and mercury. On the 14th he was very drowsy and was much more stupid. He would not speak and there was great difficulty in making him take food. He evidently did not realise where he was. He vomitted once after dinner. There were aimless movements of his hands.

At 7.30 P.M. the patient exhibited a constant up-and-down movement of the left arm which was not purposive. There was no twitching of the muscles. He could move his legs freely and equally well, but kept his right arm still unless a stimulus sufficiently strong to be painful was applied. On the morning of the 15th he was much more stupid—could hardly be roused and could not be made to answer except by a grunt or monosyllabic sound. His breathing was sometimes almost stertorous and had a tendency towards the Cheyne-Stokes type. There was slight rigidity of the right arm. On pinching his face he carried both hands up to the painful part. He was in much the same condition up to 8.30 P.M., when it was noticed that he had slight difficulty in swallowing and that his breathing had become more Cheyne-Stokes-like. His pulse since admission had been slow, ranging between 60 and 68. The temperature was normal but had shown a tendency to rise to about 99° during the previous twenty-four hours. The blood examined showed about 8000 leucocytes—about the same number as two days before. There was no anæsthesia anywhere. The projection over the left frontal eminence was still present and was distinctly painful and pitted on pressure. Percussing over the region with the finger caused wincing, but there was no other painful part of the skull. Ophthalmoscopic examination showed no neuritis, the right disc showed some blurring of the edges, and there was some dilatation of the veins in the fundus.

Operation was performed on October 15th at 10 P.M.; chloroform was administered and Mr Miles operated. A horse-shoe shaped incision was made with its base over the left eye-brow. On reflecting the scalp—which was slightly œdematous—a small area of caries was exposed on the surface of the frontal eminence. It was not larger than a threepenny-piece and only affected the most superficial layer of the outer table. A small quantity of cheesy débris lay between the carious bone and the scalp. A circle of bone which included the carious area was removed with a one-inch trephine. The inner aspect of the bone was normal. The dura mater was not adherent, but was slightly thickened. It bulged into the trephine opening and gave evidence of considerable intracranial tension. On incising the dura mater the brain substance appeared to be normal, but it did not pulsate. On introducing the finger a

firm nodular mass could be detected occupying the tip of the frontal lobe. The trephine opening was enlarged by rongeur forceps. The tumour was then recognised to be definitely circumscribed and to have a thin covering of cortex over it. To the finger it had the consistence of a normal prostate as felt per rectum. It was easily shelled out without causing any hæmorrhage. The brain pulsated freely as soon as the tumour was removed, and the cavity in the frontal lobe was immediately filled by the brain matter bulging into it. The wound was closed, a small strand of iodoform gauze being left in as a drain at one corner. After removal the tumour was found to be evenly lobulated, having a shape which suggested a comparison to a tomato. It was uniformly firm, of a dull grey colour, and apparently not very vascular. It measured 2 inches long, by 1½ inches broad and 1¼ inches in thickness. The microscopic examination, made by Dr T. Shennan, showed it to be composed externally of young connective tissue, which towards the centre gradually passed into caseous material like that found in syphilitic conditions. It was therefore a syphiloma. Next day (the 16th), although somewhat dull, he was able to answer questions. He knew that he was in hospital and he recognised his wife. The following day on the house surgeon going into the ward the patient said, "Good morning, doctor," before the house surgeon reached his bedside. He spoke voluntarily and answered questions in a bright and lively manner—in fact, it was thought that he did so a little too promptly. His condition suggested that of a man who had had a little too much alcohol. He did not wait to be spoken to or asked a question, he started the conversation on his own account. The slight paresis of his face was gradually passing off. On the second day he voluntarily controlled his bladder and bowels and asked for the bed-pan when he required it. He had no discomfort in the head. On the 18th he resembled still more a man slightly intoxicated, began to use bad language, and became emotional. On the 21st the patient was still emotional. He remembered events that happened some time before his admission to hospital, but not those immediately preceding. He did not remember coming to hospital. He asked about the yacht-race—an event in which he had been pecuniarily interested, and which had been attracting much attention for a few weeks previously. On the 28th and 29th he complained of pain in his head. The pain

was over the seat of the wound, but there was nothing made out to cause it. Iodide of potassium was prescribed. He was able to be up on November 12th and has continued well ever since; he was shown at the meeting of the Edinburgh Medico-Chirurgical Society on December 4th, 1901.

The chief points that enabled us to arrive at a diagnosis as to the localisation of the lesion that produced the symptoms in the patient may be summarised as follows. The symptoms undoubtedly pointed to the cerebrum rather than to any other part of the nervous system. The only symptom which might have caused confusion was the apparent want of control over his bladder and rectum. Careful inquiry, however, showed that the loss of control had a higher origin than the spinal cord—that, in fact, we had to do with a case in which as far as these functions were concerned the man had been reduced to the animal condition as in advanced dementia. Associated with this symptom was that of loss of modesty and shame, just as one finds in cases of dementia, where there is a gradual involution of the nervous system beginning in the higher levels. The general condition of the patient and the short duration of the illness enabled us, however, to exclude dementia. It was not quite so easy to exclude cerebral softening due to embolism or thrombosis, but the history of the case—viz., the gradual onset of the symptoms (there being no history of a sudden attack and especially no history of distinct paralysis of motion or sensation either general or of the special senses)—pointed to the softening, if present, being in the frontal region and not in any area further back. Cerebral thrombosis or embolism, however, is very rarely limited to the frontal region and is very much more common in the central regions of the brain—*i.e.* in the areas supplied by the middle cerebral and its terminal branches in the Sylvian fissure. Hæmorrhage was excluded for almost the same reasons as were embolism and thrombosis, but especially from the history of the gradual onset, although it was necessary to bear in mind that the rapid increase in the severity of the symptoms the day before the operation might have been due to hæmorrhage from a previously existing tumour. This rapid progress, however, was thought to be more probably due to congestion and œdema—a condition which frequently comes on where there is a tumour and often leads to a suddenly fatal issue. Abscess was ex-

cluded from the history and from the absence of fever and of leucocytosis.

The symptoms which pointed to tumour were—the gradual onset and the apparent steady increase and progress of the symptoms from the time that the patient gave up work about a month before admission. These symptoms indicated a gradual increase of intracranial tension. The slow and dull cerebration with depression of spirits, together with the slowness of the pulse and the attacks of vomiting without apparent cause, were very suggestive of increased intracranial tension. The usual eye symptoms were absent, but unfortunately only one eye could be examined, and that the one on the opposite side from the lesion. His good eye, although it had no optic neuritis, showed blurring of the edges of the disc with some dilatation of the veins. A tumour being indicated, was there anything pointing to its seat? In the first place, we had a symptom which pointed to a lesion of the left side of the brain —viz., the very slight paresis of the right arm, the more distinct paresis of the right side of the lower part of the face, with dysarthria in speaking, but no aphasia. The symptom pointed to an implication of the fibres passing from the lower part of the Rolandic areas to the internal capsule. The fact that there was no aphasia showed that Broca's convolution was not affected, and as there was much less affection of the arm than of the face the lesion producing this symptom was almost certainly in the centrum ovale subcortical to the lower part of the Rolandic areas. One other symptom pointed to the left side of the cerebrum. There was a slight but distinct swelling over the left frontal eminence which was painful to pressure and was slightly soft in the centre. This was felt to be distinctly external to the bone, but as he had a cicatrix over the other side of his forehead where he had had a previous swelling three years before which had been incised, the present one was looked on as specific in character and therefore might be associated with a gumma on the internal surface of the skull. These two symptoms, therefore — viz., the presence of the paresis of the right side of the face and the presence of a swelling over the left frontal region—apart altogether from his mental symptoms, pointed to the tumour being on the left side. His mental or psychical symptoms were, however, not only confirmatory, but if they had been taken alone would

have been sufficient to have justified an operation over the left frontal region. These symptoms may all be considered as a loss or depression of the inhibitory power of the individual. Such symptoms are exceedingly difficult to analyse and are even more difficult to describe. The absence of such symptoms renders a man what he is, gives a man his distinctive character in relation both to the lower creation and to his fellow-men—the presence of such symptoms alters the *ego* of a man, takes away his special mental characteristics, and reduces him to a lower level. The loss of inhibition of his organic centres, such as those of the bladder and rectum, we have already referred to. His emotional condition was a prominent symptom in his case. The loss of his sense of modesty and shame we have also alluded to. These quite evidently point to loss of inhibition and are important symptoms in prefrontal lesions. But to many the loss or diminution of the faculty of attention—the most prominent symptom in his case—will not so evidently appear as a loss of inhibition. Yet so it is; there can be little doubt that attention is largely an inhibitory process—in fact, some psychologists consider it entirely so. Be that as it may, a want of the power of attention was a marked feature in this case. His attention could be directed for a second to any object or statement, but only for a second. The next second he was apathetic and listless and required to be again roused. Closely allied to this loss of attention was his loss of power of forming a judgment about anything. He could not compare or contrast two things or ideas. This again may have been due to his want of power of sustained attention, his not being able to have two ideas in his mind at one time. His individual memories seemed all right. He saw objects, knew what they were for, and could name them all right. Whilst his memory for objects and things that he had seen before his illness was unimpaired, his memory for things that were shown him and events that happened since the onset of his most marked symptoms was very imperfect. He forgot what happened almost immediately. This probably in part resulted from the diminution in his power of sustained attention and in part from the general depression of the cerebrum due to the intracranial pressure, so that recent memories did not become fixed, because fixation in memory requires health and nutrition. This is proved by

the fact that even now when he has recovered he has not regained the memory of events that happened for some time before his admission to hospital. It is questionable whether the prefrontal lobe has anything specially to do with the fixation in the memory apart from the faculty of attention—although the process of voluntary recollection is probably initiated in the prefrontal lobe. The symptoms exhibited by this patient have been pointed out as occurring in prefrontal lesions and there are now a good many such cases in medical literature. The time has come when we should discard the idea that the prefrontal lobes are "silent regions." Far from being silent regions, the left prefrontal at least speaks in decided if little understood language as being the seat of faculties the loss or deterioration of which completely changes the character of a man. There is much evidence to show that the left prefrontal, just as the left Broca's convolution, takes a more prominent part in higher cerebration than the right prefrontal, but into this question we have no intention of entering at present. The best summary of the symptoms of prefrontal tumours which we can find in medical literature is that of Allen Starr, of New York, who along with M'Burney[1] in 1893 described a case very similar to ours in which a sarcoma was removed from the frontal lobe. The position of the tumour was, however, somewhat further back than in our case, and therefore produced more symptoms pointing to the motor areas. Starr[2] had in 1884 made an inquiry into the symptoms of twenty-three cases of disease of the frontal lobes and found that decided mental disturbances occurred in half of them. The following were his conclusions: "The form of mental disturbance in lesions of the frontal region does not conform to any type of insanity. It is rather to be described as a loss of self-control and a subsequent change of character. The mind exercises a constant inhibitory influence upon all action, physical and mental, from the simple restraint on the lower reflexes, such as the action of the sphincters, to the higher control over the complex reflexes, such as emotional impulses and their manifestation in speech and expression. This action of control implies a recognition of the import of an act in connection with other acts—

[1] "A Contribution to Cerebral Surgery," *The American Journal of the Medical Sciences*, April 1893.

[2] "Cortical Lesions of the Brain," *ibid.*, April 1894.

in a word, it involves judgment and reason, the highest mental qualities. By inhibiting all but one set of impulses it enables one to fix the attention upon a subject and to hold it there. It seems probable that the processes involved in judgment and reason have for their physical basis the frontal lobes, if so, the total destruction of these lobes would reduce man to the state of an idiot, while their partial destruction would be manifested by errors of judgment and reason of a striking character. One of the first manifestations would be a lack of that self-control which is the constant accompaniment of mental action and which would be shown by an inability to fix the attention, to follow a continuous train of thought, or to conduct intellectual processes. It is this very symptom that was present in one half of the cases collected. It occurred in all forms of lesions—from injury by foreign bodies, from destruction by abscess, from compression and softening due to the pressure of tumours—and therefore cannot be ascribed to any one form of disease. It did not occur in lesions of other parts of the brain here cited. But its presence in such a large number of these cases warrants the suggestion that in cases of suspected lesion of the frontal lobe the mental condition of the patient as shown by his acts of judgment and reason should be carefully examined and a change of character or behaviour carefully noted." It would be impossible for us to wish to have a better description of the symptoms of our case than this of Starr, the result of an investigation into the symptoms of frontal lesions. Ferrier,[1] Welt,[2] Gilman Thompson,[3] Griffith and Sheldon,[4] as well as other neurologists and psychologists, have produced evidence more or less in favour of these conclusions. We would point out one other symptom in this case, which has also been pointed out by Bruns,[5] as occurring in cases of frontal tumour—viz., staggering on walking or attempting to walk. Our patient had this symptom, and Bruns points out that it may suggest cerebellar disease. He says that the symptom is usually absent in tumours of the Rolandic areas. It has been suggested that the symptom may arise from involvement of the bundle of fibres

[1] "Functions of the Brain," and "Croonian Lectures," 1890.
[2] *Alienist and Neurologist*, April, 1890.
[3] *Medical News*, 1891.
[4] *Journal of the Medical Sciences*, 1890, p. 223.
[5] *Deutsche Medicinische Wochenschrift*, February, 1892.

which are known to pass from the frontal lobe to the cerebellum. The same bundle may explain the fact that our patient at the beginning of his illness had an intense pain in the back of the head which, however, gradually passed round to the frontal region. It is interesting to note the symptom in connection with the opposite condition which has been pointed out by Dr Purves Stewart, that cerebellar lesions may be accompanied by frontal pain.

The removal of the tumour was followed by a rapid disappearance of the dull and depressed symptoms in this case, and the only mental symptom that has been noticed since is what one would describe as good cerebration evidenced by slight "forwardness" and sometimes "witticism." Oppenheim and Jastrowitz have pointed out that "hilarity" and "witticism" are accompaniments of frontal tumour, but we would suggest probably only before intracranial pressure gets too great. These symptoms are probably explained by slight injury to some of the structures concerned in voluntary inhibition. The condition is allied to that seen after administration of a moderate amount of alcohol, the result of the alcohol being, according to some authorities, the reduction of inhibitory control. It is a curious fact that the affection which produced the swelling over the frontal bone was not structurally connected with the tumour in the frontal lobe. That tumour had begun at the anterior part of the lobe and had extended backwards and downwards, pushing the structures before it, until latterly it had implicated the fibres passing from the lower Rolandic areas to the internal capsule, so producing the paresis of the right side of the face and of the arm.

Meeting V.—February 5th, 1902

PROFESSOR T. R. FRASER, M.D., LL.D., *President, in the Chair*

I. ELECTION OF MEMBER

Samuel Fergusson, M.B., C.M., Alloa, was elected an Ordinary Member of the Society.

II. NOTIFICATION OF INFECTIOUS DISEASES

On the motion of Dr Matheson Cullen, it was agreed to "petition the Town Council to continue the notification of Measles."

III. EXHIBITION OF PATIENTS

1. *Dr William Stewart* exhibited a patient after COMPOUND DISLOCATION OF THE ANKLE, with fracture of the neck of the astragalus and removal of the outer malleolus.

Fifteen months ago a heavy iron plate fell on this patient's left knee, when he was in stooping position with the knee flexed. The ankle gave way, and the foot twisted outwards till it was nearly at a right angle to the leg.

On admission to Leith Hospital, there was found to be a compound dislocation of the astragalus, the upper articular surface presenting in the wound, and looking upwards, and inwards, and rotated outwards. The astragalus was also fractured through the neck.

The internal malleolus was fractured and stripped of its periosteum. After removing the loose internal malleolus, the astragalus was replaced, the cavity having been previously thoroughly washed out with 1-40 carbolic lotion. A counter opening was made in the outer side and drainage-tube introduced.

The leg was put up in a box splint, and the patient made an uninterrupted recovery. Passive movement was begun in the fourth week, and he was discharged in the seventh week. He has now all the movements of the ankle joint with the exception of a limitation of the transverse movement, and can walk nearly as well as before the accident; and follows his usual occupation, which involves at times his carrying heavy weights.

2. *Dr Byrom Bramwell* exhibited a CASE OF INFANTILISM. A patient, who looked like a boy of 11 or 12, but who was in reality $18\frac{10}{12}$ years of age—he would be 19 on 3rd May 1902. The case was an example of arrested bodily growth, without arrested mental development; the patient was a sharp, bright, intelligent boy. The different parts of the body were perfectly proportioned. The genitalia were quite infantile. There were no appearances either in the physical or mental condition suggestive of sporadic cretinism. There was no evidence either in the condition of the patient himself or in the family history of inherited syphilis—a condition to which arrested development and stunted stature were sometimes due; or of rickets or tubercle. The only apparent cause for the arrested bodily development was chronic diarrhœa. The patient had suffered from diarrhœa for nine years. At the time of his admission to the Infirmary on 31st October, the motions numbered three, four, or five per diem; they were copious, liquid, and of a yellowish-brown colour. Dr Bramwell had had the opportunity of showing the patient to Dr John Thomson, who told him that he had seen more than one similar case; and, further, he stated that in one of his cases, at least, there had been chronic diarrhœa.

The physical examination failed to disclose any cause for the diarrhœa. The abdomen was slightly distended; the stomach appeared to be quite normal; the appetite was good. Dr Bramwell had come to the conclusion that the diarrhœa apparently depended upon defective digestion in the upper part of the gastro-intestinal tract, and suggested to Dr Thomson the possibility of the pancreatic secretion being defective. Dr Young (Dr Bramwell's junior house-physician), who was present when this remark was made, had taken the hint, and had planned and carried out an elaborate investigation with regard to the condition of the pancreatic secretion. Dr Young deserved great credit for this research, which clearly showed a defective or arrested pancreatic secretion. The research was conducted on three lines.

In the first place, he found that the stools contained a quantity of undigested fat, which became very much less marked, in fact practically disappeared from the stools, after the administration of pancreatic extract.

In the second place, the patient had been placed on a

milk diet, and the amount of phosphoric acid in the urine (*a*) before, and (*b*) after, the administration of pancreatic extract had been estimated. Dr Young informed Dr Bramwell that when a patient is placed on milk diet, the caseinogene is the only source if phosphorus in the urine. The caseinogene is broken up in the stomach into paranuclein and a proteine; paranuclein is insoluble; but when paranuclein comes in contact with the pancreatic juice, it is converted into paranucleinic acid, which is soluble. This is the source of the phosphorus (phosphoric acid) in the urine. Dr Young found that the amount of phosphoric acid in the urine in this case, when the patient was taking a milk diet, was extremely small, and that after the administration of the pancreatic extract the amount of phosphoric acid in the urine underwent a very marked and rapid increase.

In the third place, on Dr Bramwell's suggestion, the test capsules invented by Professor Sahli, of Berne, were administered. These capsules contain iodoform surrounded by a glutoid substance which is insoluble in the gastric juices, but which is soluble in the pancreatic secretion. After the iodoform is set free by the solution of the capsule, free iodine may be demonstrated in the saliva by testing with chloroform and nitric acid; the nitric acid sets free the iodine from the iodide of potassium, and the free iodine gives a pink colour to the chloroform. The test is a beautiful means of demonstrating (1) the length of time that food remains in the stomach, and (2) whether the pancreatic secretion is active or not. If no iodine reaction is obtained after the administration of the capsule, it may be concluded either that the capsule has not passed from the stomach or that the pancreatic secretion is in abeyance. After the administration of a capsule in this case, iodine could not be detected in the saliva. That the capsule had passed from the stomach was proved by the fact that it was found undigested in the stools. This experiment was repeated more than once.

The next step in the investigation was to administer a capsule along with food, and then two hours afterwards to give a dose (2 drachms) of pancreatic extract; the saliva contained iodine an hour after the pancreatic extract had been administered.

Dr Young had consequently shown by the three different tests which have just been enumerated that in this case the

pancreatic secretion was either very defective or completely in abeyance.

After this conclusion was arrived at, the patient had been treated by the administration of pancreatic extract—3 drachms per diem. The result of this treatment has been: (1) That the diarrhœa had become greatly lessened—on an average there were now only two stools per diem. (2) That during the six weeks of pancreatic treatment the patient had increased half a stone in weight—on admission to the Infirmary (on 31st October) the patient's weight was 4 st. 8¼ lbs., and on 27th December, when the pancreatic treatment was commenced, 4 st. 7½ lbs.; it was now 5 st. 0½ lb. (3) That during the six weeks of pancreatic treatment the patient had gained nearly half an inch in height. On his admission to the Infirmary (on 31st October) his height was 4 ft. 3¼ ins.; and on 27th December, when the pancreatic treament was commenced, 4 ft. 3¼ ins.; it was now almost 4 ft. 3⅝ ins. It might, of course, be said that half an inch was not a marked increase, but, considering that the patient's growth had been entirely arrested for several years, a growth of half an inch in the course of six weeks was very considerable.

Dr Bramwell did not wish to attach too much importance to the diminution of the diarrhœa for he knew that there were many fallacies which had to be taken into account, such as careful dieting, rest in hospital, etc.

To sum up: (1) The case was one of "infantilism," in which the only apparent cause for the arrested development was chronic diarrhœa apparently due to defective metabolism in the upper part of the gastro-intestinal tract. (2) Dr Young's research had undoubtedly shown that the pancreatic secretion was defective or entirely abolished. (3) Under the administration of the pancreatic extract the diarrhœa had improved, the patient had gained half a stone in weight, and had grown nearly half an inch. (4) It was consequently reasonable to suppose that defective pancreatic secretion was the cause of the diarrhœa and perhaps of the arrested growth, *i.e.* of the infantilism. At all events, this suggestion should be carefully investigated in future cases. It was possible that we had in these facts an explanation of this rare and remarkable condition. Dr Bramwell further stated that, so far as he knew, there was no published account of the condition termed "infantilism" in

literature. Dr John Thomson had informed him that in French works and papers on children's diseases, the term "infantilism" was often used, but he had not been able to find, or to refer Dr Bramwell to, any definite account of the condition. So far as Dr Bramwell has been able to ascertain it was used to express arrested development due to whatever cause (defective or abolished thyroidal reaction, congenital syphilis, rickets, tubercular disease, etc.). This case seemed to show that there was a special form of infantilism—which should be regarded as a definite clinical entity—quite distinct from the arrested bodily development due to sporadic cretinism, congenital syphilis, rickets or tubercle.

3. *Mr F. M. Caird* exhibited—

(*a*) A patient, aged 61, from whom he had removed eighty inches of bowel on account of chronic obstruction due to stricture. The stricture was a hard annular bobbin-shaped mass situated in the ileum, and the mesenteric glands were implicated to a very large extent, and their removal demanded the huge sacrifice of small intestine and of the cœcum. End to end suture was carried out on the second day after the primary operation and the patient made a perfect recovery. Microscopic examination revealed a hyperplastic chronic tuberculous stricture and glands. The preparation removed was shown.

(*b*) A patient, æt. 65, who had suffered from RODENT ULCER for six years and who had been subjected to various operative procedures prior to the use of the Rontgen rays. In November 1901 it appeared that only a formidable excision could help the patient, which would involve the loss of the right globe, since the inner canthus, lower lid and surrounding structures were involved. It was accordingly advised to ask the authorities in the skin department to apply the X-rays, which was done greatly to the benefit of the patient, a marked diminution in the ulcerated area ensuing. On 10th January treatment was stopped since progress seemed to be arrested, and great erythema had been caused, and it was thought better to complete the cure by excision and a plastic operation. From this date, however, rapid healing set in and the patient was shown with a slight superficial scab covering the last vestige of the sore.

4. *Dr Dawson Turner* exhibited—

(*a*) A patient suffering from LUPUS VULGARIS; and (*b*) one suffering from RODENT ULCER. Both had been treated for some time with the Rontgen rays with slow improvement, and afterwards with ultra violet light with rapid improvement. The light had a more powerful effect upon the rodent ulcer than upon the lupus; five exposures to the light sufficed to cause the ulcer to cicatrise over. Dr Görl, of Nuremberg, and Dr Walsham, of London, have been using a similar source of light.

IV. Exhibition of Instruments

1. *Dr Dawson Turner* exhibited an APPARATUS FOR GENERATING ULTRA VIOLET LIGHT. The ultra violet radiation of a condenser spark gap as tested by him is altogether of a higher order than that of a Finsen arc light, while the heat radiation is almost negligible, thus the light can be brought much nearer the affected part without the interposition of a cooling and somewhat opaque stratum of water. Ice or rock salt can be used as compressing agents. The clinical results have been very good, an exposure of two and a half minutes being sufficient to produce a marked effect.

2. *Mr Robert Purves* exhibited a SCREEN, devised by Dr Henle, Assistant Professor in the Surgical Klinik at Breslau. The screen consists of a light wire framework attached to clamps, which serve to fix the apparatus to the operating table. When the patient is anæsthetised the clamps are fixed, one on either side of the table at the level of the patient's neck. The wire framework is fitted into the clamps and arches over the patient, after the manner of an inverted U. A piece of mœstig battiste, having a crescentic portion cut out from the centre of one edge, and two tapes attached to the corners of the crescent, is then laid over the framework, the tapes are passed round the patient's neck and tied firmly at the side, care being taken that the neck should be encircled sufficiently tightly to prevent the finger being readily passed beneath the tape. Lastly, a sterile square is laid over the battiste. Thus an aseptic screen is erected between the

anæsthetist and the operator, which precludes the possibility of infection of the surgeon's hands or of the wound, arising from contact with the anæsthetist's hands or his apparatus. Moreover, if the patient vomit unexpectedly, the probability of contamination of the wound, or its immediate surroundings, is greatly diminished. The apparatus is of special service in operations on the thorax and axilla, such as removal of the breast; on the neck, such as removal of the thyroid or tuberculous glands in the lower part of the neck. The apparatus can be rapidly fixed on and arranged after a trial, and is of undoubted advantage as a precautionary measure in such operations.

V. Exhibition of Pathological Specimens

1. *Dr Logan Turner* exhibited—

(*a*) Malignant disease of the upper end of the œsophagus, lower pharynx, and larynx. The patient was a woman, æt. 48, who first complained of difficulty and pain in swallowing seven years before her death. The actual presence of a stricture was diagnosed three and a half years before death. The larynx and upper end of the œsophagus was excised by Mr Alexis Thomson, in December 1901. The growth, which was found to be a squamous-celled carcinoma was one of very unusual duration.

(*b*) Malignant disease of the upper end of the œsophagus. The patient was a woman, æt. 58, who suffered from pain and difficulty in swallowing for six months before death. Post-mortem examination revealed a stricture, 2 to 3 mm. in diameter, behind the cricoid cartilage. The right recurrent laryngeal nerve was involved in the tumour mass, which was a squamous-celled carcinoma. The history of this case shows a striking contrast to that of the previous one.

(*c*) Larynx and trachea from a case of diphtheria. The patient was a girl, æt. 8, who died without any medical advice having been called for; the illness lasted two to three days. There was a small piece of membrane on the left tonsil and ulceration of the right. The epiglottis was inflamed and swollen, and its laryngeal surface was covered with membrane. There was also some membrane in the openings of the

ventricles and on the vocal cords. The area of bright red exudation extended down the left side of the trachea and into the left bronchus. From the exudation, which presented no evidence of membrane, and from the membrane in the larynx the Klebs-Löffler bacillus was obtained.

2. *Mr Robert Purves* exhibited for *Professor Annandale*—

(*a*) A specimen showing RUPTURE OF THE FEMORAL VEIN, and of the inner and middle coats of the femoral artery, resulting from fracture of the thigh.

The particulars are as follows: The patient, H. K., a young man, while loading coal, slipped and got his right leg crushed between a travelling bogie and the platform. The leg was found twisted round like a rope, the thigh was swollen, there was an obvious fracture about the middle of the femur, and pulsation was absent in the tibial arteries. Was admitted to the Infirmary on the evening of the same day (December 9th) in a state of extreme collapse.

On the following day (December 10th), condition was much the same, but the circumference of the thigh was unaltered; the limb remaining cold and pulseless. At 12.30 P.M. two pints of saline were introduced into the med. basilic vein. The immediate improvement was most marked. From 160 his pulse-rate had in ten minutes fallen to 130, and also increased in volume. His pupils, which had hitherto been dilated, began to *diminish* in size, and to react to light. His restlessness disappeared, and he described his sensation of the change as one of great relief from oppression.

On the 11th his leg showed unmistakable signs of gangrene, and now that his general condition was so much improved, it was arranged to amputate the limb, which was accordingly done by Mr Annandale on the 12th. Under chloroform a temporary ligature of thick catgut was first applied to the common femoral artery, and then the limb removed by one circular sweep at the level of the upper and middle thirds. The projecting part of the upper fragment was sawn off, and the soft parts temporarily approximated with wire sutures.

On examination the specimen showed that the fracture had been comminuted. The femoral vein had a complete tear in one side of it, and on drawing it aside a fragment of

bone was found, lying on the artery and compressing it. On opening the artery it was found that the inner and middle coats had been ruptured, but that the external coat was intact. The effect of the injury on the artery having been very much the same as that to be expected by a tight ligature.

(*b*) The PORTION OF THE FEMUR removed twenty-six days later from the same patient, to obtain accurate approximation of the soft parts. The specimen showed a mass of granulations covering the end of the bone, which at points had commenced to form bone, also a commencing necrosis of the femur at one part of the circumference. The progress of the case has been favourable though slow.

(*c*) A large BRANCHED RENAL CALCULUS, weighing 1194½ grs., removed in pieces from the left kidney of Mrs M., aged 32. The history of renal colic was of ten years' duration, and on two occasions a small stone was passed. There was a large fluctuating swelling projecting from beneath the ribs. Urine was purulent. The kidney was aspirated on exposure, and a quantity of pus removed before the stone was extracted. The patient died of shock and exhaustion on the fourth day. The post-mortem showed abdomen and other organs to be healthy.

(*d*) A large EPITHELIOMATOUS ULCER, measuring 9 × 6 cm., removed from the back of the neck of John B., aged 60. It had commenced twelve years previously as a small papule, which had become ulcerated and had never healed. Removed with the Thermo cautery.

(*e*) A VESICAL CALCULUS (uric acid) removed through a suprapubic opening with some difficulty, owing to its impaction between the lateral lobe of the prostate and the bladder wall. It showed a curious irregular moulding resulting from its peculiar position.

3. *Mr F. M. Caird* exhibited a specimen of TUBERCULOUS STRICTURE OF INTESTINE (with microscopic preparation) from the patient exhibited by him at this meeting.

VI. Original Communications

1. A CASE OF CHLOROMA, WITH PATHOLOGICAL REPORT AND SOME NOTES DESCRIPTIVE OF THE DISEASE

By G. H. MELVILLE DUNLOP, M.D., F.R.C.P.Ed., Physician to the Royal Hospital for Sick Children, Edinburgh

At the November meeting of the Edinburgh Medico-Chirurgical Society I exhibited a little boy suffering from that exceedingly rare disease—chloroma. The child subsequently succumbed to the disease, and I propose in the following remarks to give a record of the case, together with an account of the necropsy, and some notes of the interesting condition from which the boy suffered.

J. D., aged 5 years, was admitted to my ward in the Sick Children's Hospital on September 30th, 1901, complaining of great weakness and "swelling of the face."

History

Family History.—This was unimportant. The father had suffered from an attack of rheumatic fever, and the mother from repeated attacks of bloodlessness. Two children had died during infancy. There was no family history of tubercle or renal disease.

Previous History.—The child was born at full term, and was a healthy baby. He had whooping-cough at six months and measles at three years, and had suffered frequently from bronchitis, but, on the whole, the mother considered him a fairly healthy child until the commencement of his present illness.

Present Illness

For fully a year patches of ecchymosis were frequently noticed under the boy's skin, which were attributed to bruises. In May 1901, the attention of the mother was for the first time directed to the extreme pallor of the boy's complexion. For some months previous to this date it was observed that any scratch which he received appeared to suppurate almost immediately. At the beginning of June he was dipped into a horse trough by an older boy, and was wet through. He

FIG. I.—Showing the exophthalmos, the infiltration of the eyelids, and the prominence in the temporal region.

FIG. II.—Showing the tumours commencing to appear in front of the eyeballs.

TO ILLUSTRATE DR G. H. MELVILLE DUNLOP'S PAPER.

remained in his wet clothes for some hours, and in consequence got a bad chill and was confined to bed for some days suffering from fever and headache. The child was never the same after the wetting, and seemed to get more easily tired. He commenced to call out in his sleep, and to snore at night, which he had never done previously. His appetite became exceedingly poor, and he became steadily paler and thinner.

At the beginning of August he became dull and languid, ceased to care to play, or to desire to go out of doors. On August 16th the mother noticed for the first time that the eyes appeared prominent, and that the veins on the eyelids were dilated. This exophthalmos gradually increased. About the middle of September it was noticed that the boy was becoming deaf, and this symptom also became more marked. Ever since he was three years of age he had suffered much from toothache, and the teeth had always been bad.

At the commencement of October the child was treated for an abscess of the scalp, and had an attack of albuminuria, accompanied by pyrexia, which lasted a few days.

State on Admission

The boy looked extremely ill. Development was fair, but nutrition was poor; weight, 39 lb. The complexion was very pale, of a waxy yellow tint. His attitude was normal, and he could stand, sit up, or walk. He was a quiet, placid, good-tempered child.

Cutaneons and Glandular System.—A large number of petechial hæmorrhages, about the size and having the appearance of fleabites, were scattered over the skin of the neck, chest, back, abdomen, and all four limbs, the face only being exempt. There were in addition two larger hæmorrhages situated over the dorsal portion of the spinal column and over the right knee, while there was a yellow discoloration, as if of an older hæmorrhage, situated on the right shin. The skin was somewhat loose, but there was a fair amount of subcutaneous fat. The head was well shaped and the scalp healthy. The face was pale and pasty, with marked puffiness of the eyelids, especially on the left side. There was some œdema and marked anæmia of the conjunctivæ. Considerable pro-

trusion of both eyeballs was present, but the patient could close his eyes. The nose and ears were well shaped. There were a few slightly enlarged glands under the lower jaw on both sides, and also in the posterior triangles of the neck and in the groins. The axillary glands were not enlarged. The thyroid was normal in size. There was no dulness over upper part of sternum, pointing to enlargement of the thymus. The thorax was well shaped.

Respiratory System.—The breath sounds were normal all over, and there were no accompaniments. There was no dulness and no cough. The voice was rather low and whispering.

Circulatory System.—The apex beat was in the nipple line, fifth space. There was no pulsation in the neck or epigastrium. The upper border of the area of dulness was in the second space; the right border half an inch external to the right border of the sternum. The left border was in the left nipple line. The heart sounds were healthy in all areas. Loud hæmic *bruits* were heard on both sides in the vessels of the neck, loudest on the left side.

Pulse 110, was irregular in time and force, of fair volume and low tension. The vessel wall was not thickened. The temperature was 99.6° F.

The *abdomen* was sunken. There was no pain or resistance on palpation. No glands were felt, and no fluid was present. The liver and spleen were not enlarged. The note was resonant all over.

Digestive System.—The lips and gums were pale; the tongue dry with transverse grooving. The teeth were extremely bad, both in the upper and lower jaws, more than half of them being carious. The molars were chiefly affected. The breath was very offensive.

The *urine* was clear, amber and acid. There was a slight mucous cloud, but no deposit; albumen (0.4 gr.); urea, 8 gr. Centrifuged: no casts or blood corpuscles.

Blood.—Hæmoglobin, 32 per cent. Red blood corpuscles 1,800,000; leucocytes, 24,500. Films showed a large number of lymphocytes, both large and small, the former preponderating, and numbering 73 per cent. Polymorphonuclear 17 per cent. Myelocytes 5 per cent. unclassified, and transitional forms resembling myelocytes 5 per cent. A few nucleated reds were also present.

After History

October 15th.—The weight remains stationary. Two fresh hæmorrhages have appeared on the outer aspect of the right knee and one over left end of radius. The eyeballs are becoming more prominent and the left eye cannot now be covered with the eyelid without an effort. The deafness also appears to be increasing. The ears were to-day examined by Dr Logan Turner, who reported that there was some drawing in of both membranes, but no sign of perforation or of other disease. On examining the inside of the mouth a hard indurated swelling of a purplish colour was observed occupying the hard palate on both sides in its whole extent antero-posteriorly and extending laterally from the teeth nearly to the median raphé. The discoloration, however, extends to the middle line. A similar but smaller swelling has made its appearance on the right side of the lower jaw external to the teeth.

October 22nd.—Since last report a smooth rounded swelling, not nodular, has appeared in each temporal region gradually shading off into the surrounding parts. The swelling reaches behind to about half an inch in front of the pinna and in front to the outer edge of the orbit and seems to be continued into the orbit. The swelling is firm but not of a bony hardness. It feels as if immovably fixed to the underlying bone in its deep attachments, but is unattached to the skin. The diagnosis of chloroma was made on this date.

October 25th.—The eyeballs are decidedly more prominent, and the veins on the eyelids more distinct. There is intolerance of light, especially of bright light, and the child lies with the head under the bedclothes. The upper eyelids are infiltrated, especially in their outer halves, with firm smooth swellings which seem to proceed from under the roof of the orbit in the region of the lachrymal gland and extend to the margin of the tarsal cartilage. They resemble the swelling in the temporal region in being firm, smooth and rounded, and unattached to the skin of the eyelid. There is a similar swelling in the right lower eyelid appearing to come from under the lower margin of the orbit, and it occupies the whole extent of the eyelid from canthus to canthus. The patient can still close his eyes with an effort, but the exophthalmos is

so marked that during sleep the eyeball is not much more than half covered. There is considerable flow of tears from the eyes which run over the face. An ophthalmoscopic examination of the eyes was made by Dr Argyll-Robertson, who reported: In right eye a minute extravasation of blood near the disc. Retinal veins tortuous and moderately distended in both eyes. Exudation into disc and retina in both eyes. The vessels are lighter coloured than usual in optic neuritis, otherwise appearance is very much that of optic neuritis. Leucocytes have increased to 54,000. The child complains of no actual pain and appears to be happy and contented.

November 2nd.—Exophthalmos is increasing and the veins on the face and eyelids are more prominent. The boy is much duller, and is taking less notice. Leucocytes, 68,000; red blood corpuscles, 850,000; hæmoglobin, 20 per cent; swelling in temporal regions more prominent.

November 9th.—A pale greenish yellow tumour of a jelly-like consistence made its appearance on November 6th at the inner canthus of the right eye and has gradually advanced over the eyeball, covering its lower half. To a smaller extent the left eye is becoming covered with a similar tumour. The boy is now complaining of severe pain in the frontal region, which he constantly presses with his hands. Photophobia is increasing, and the head is kept continuously under the bedclothes. The temperature, which previously seldom rose above the normal, has during the last ten days ranged from 99° to 101° F., the pulse also has increased in frequency from 110 to 140. The boy takes his food badly, and is becoming thinner and weaker. He has sleepless nights, and calls out frequently with pain. He complains especially of pain in his eye, which he constantly rubs with his fingers and handkerchief. The tumours in the temporal region appear to have diminished in size. Deafness is increasing. There is very marked optic neuritis in the right eye, and several linear hæmorrhages near the margin of the disc to the inner side. The optic neuritis in the left eye is still more marked. There are several hæmorrhagic spots opposite the lower margin of the disc. The vessels are still of a rosy colour.

November 12th.—The tumour growth now completely covers both eyeballs. The corneæ are apparently quite

destroyed. The boy cannot discern objects, but can still distinguish light from darkness. The temporal tumours are much smaller. Leucocytes 107,000, red blood corpuscles 815,000, hæmoglobin 12 per cent.

November 15th.—The boy is much weaker, and has been vomiting at intervals all day. The tumour over the eyeballs is exuding a sanguineous serum. The eyeballs appear less prominent. Leucocytes 123,000. The waxy pallor of the face and engorgement of veins are very striking. The breath is most offensive, and there is a large amount of sordes on the teeth and lips. During the night coffee-ground vomiting occurred several times, and the boy died of exhaustion on the morning of November 16th.

Necropsy

The necropsy was performed on November 17th by Dr Shennan, to whom I am much indebted for the following account of the examination and of the microscopic appearances subsequently found. The surface of the body was very pale. The eyeballs were prominent and pushed forwards out of the orbits so that the eyelids did not meet.

Mouth.—The gums were thickened, pale, soft, and greenish in colour; tongue pale.

Thorax.—On removing the sternum a greenish mass, thicker in the centre than at the periphery, and about the size of a shilling, was found on the posterior surface of the manubrium sterni, in the middle line. This mass was of a bright green colour, and gradually faded on exposure to air and light. On section it was found to be confined to the periosteum, and not to affect the dense bone immediately underneath it. The spongy bone of the manubrium sterni was of a dull greenish colour. The glands in the vicinity were not apparently affected.

The Thymus Gland was unaffected.

The Serous Cavities contained a small amount of clear, pale, straw-coloured fluid. The inner surface of the larynx was pale, and contained a little brownish mucus.

The Lungs, as a whole, were pale, but were interspersed with small irregular patches of congestion, and occasional hæmorrhages. In the left lung there were small areas of

firmly consolidated lung tissue. The large bronchi, and particularly those on the right side, contained greenish mucus.

Heart.—On the epicardium there was a small green patch near the base of the ventricle, a short distance to the left of the septum, and another smaller one to the right of the septum. All the cavities of the heart were somewhat dilated, and contained *ante-mortem* thrombi of recent formation, pale in the left ventricle but redder in the right. There was marked fatty degeneration of the myocardium of the left ventricle. The arterial valves were competent. On removing the thoracic contents the ribs were observed to be of a green colour throughout their whole extent, the colour being deepest just in front of the angles. The periosteum of the vertebrae from the neck to the pelvis was infiltrated with thickened greenish tissue, continuous with a similar deposit along the intercostal vessels and nerves. The colour was most intense in the neighbourhood of the intervertebral discs, and during the progress of the post-mortem examination it visibly faded.

Abdomen.—There was general pallor of all the abdominal contents, particularly of the intestinal tract. The duodenum was dark from altered blood and green mucus. The stomach was distended and contained "coffee grounds." The small intestine in its lower part showed multiple minute hæmorrhages, and contained a large amount of catarrhal mucus. The Peyer's patches showed no visible changes. The follicles of the large intestine were distinct and greenish; the mucous membrane of the appendix was thickened.

Liver.—Bile ducts patent, substance pale, otherwise fairly normal.

Spleen.—Firm; Malpighian bodies enlarged, prominent, and pale. Section brownish in colour.

Suprarenal Capsules unaffected to naked eye.

Kidneys presented very striking naked-eye appearances; not much enlarged, but very pale; of a general pinkish-green colour, and dotted over with distinct green spots under the capsule. On section, numerous bright green areas varying in size from a pin's head to a quarter of an inch in diameter were found. These patches were chiefly placed in the cortical area near the medullæ. Both kidneys were similarly affected.

Mesenteric Glands were enlarged and pale. One or two enlarged greenish glands were observed near the head of the

pancreas, and others in the same neighbourhood contained brownish pigment. No other green-coloured glands were found in the body.

Pancreas of a pale yellowish-pink colour, and contained small greenish nodules scattered through its substance.

Urinary Bladder distended with clear limpid urine.

Cranium.—On reflecting the scalp green tissue was found extending along all the sutures, particularly the interfrontal, the coronal and lambdoidal extending from the last to the mastoid process, and occurring in thin irregular patches over the bones of the skull. These patches were confined to the pericranium, and could be stripped completely off the bones. On removing the calvarium it was observed that the diploë throughout was of a dirty greenish colour, most evident in the anterior part of the skull. Underneath, and infiltrating the substance of the temporal muscles from below, new growths from a quarter to three-eighths of an inch in thickness were found. These were close in texture, firm in consistence, and of a bright green colour, closely resembling the colour of grass. They were firmly adherent to and evidently had developed from the periosteum, and extended deeply into the spheno-maxillary fossæ. Aërobic and anaërobic cultures were made from these growths with negative results.

Dura Mater exhibited numerous thin green patches, flat, and irregular in outline. These were especially distinct in the posterior part of the cranium, and were accompanied by numerous small hæmorrhages. It stripped off the bone easily, and left a worm-eaten appearance on the inner table of the parietal bones. A broad greenish band extended along the upper wall of the longitudinal sinus.

The Brain was pale and firm, but there was no evidence of any extension to it of the greenish growth.

Spinal Cord.—No morbid change visible.

Base of Skull, Sinuses, etc.—All the bones in the anterior part of the skull were infiltrated with dull green material, especially the spongy tissue. A green mass, the size of a split pea, was found on the anterior glenoid process (sella turcica), and another but smaller one immediately behind the left posterior process. Another was found on the posterior surface of the left lesser wing of the sphenoid. The whole of the frontal bones were green, and also the upper surface of the

orbital place. There was apparent erosion of the left side of the cribriform plate posteriorly, with greenish material appearing through it.

Ethmoid Sinuses.—The condition was one of thickening of the lining membrane of a dull green colour.

Left Orbit.—Green growth similar in colour and consistence to that found in the zygomatic fossæ, but occurring in oval, flattened, and sharply defined masses surrounding the optic nerve and eyeball, particularly on upper and external aspects, but also to a less extent below, embracing the optic nerve and not attached to the eyeball, but extending under the conjunctivæ. The masses evidently arose from the periosteum on the outer side of the orbital cavity, where it was adherent to the bone. Some hæmorrhage in or immediately under the sclerotics. Cornea opaque and green conjunctiva thickened and of a purplish colour.

Right Orbit.—Appearances similar to those on the left side. Eyeball and nerve seem to be unaffected. There is a thick adherent mass on under wall of orbit. Right eye was incised; vitreous humour normal; small hæmorrhages near exit of optic nerve, and what appear like tortuous thickened vessels over fundus.

Right Ear.—Semi-circular canals and dense bone immediately around them apparently not affected, but middle ear, mastoid process, and periosteum on under surface of temporal bone and adjacent soft structures infiltrated with green material.

Left Ear.—Similar appearances.

Hard Palate.—Periosteum covering it thickened with greenish tissue, less dense than in the orbits and zygomatic fossæ.

Soft Palate, Walls of Pharynx, Mouth, and Gums infiltrated with similar material.

The Tonsils were infiltrated with bright grass-green tissue. In the right tonsil there were some small bright-green parts, evidently forming plugs in the crypts. In the left tonsil the infiltration was more diffuse than in the right, and there was an appearance like necrosis. In the maxillary antrum the changes were similar to those in the ethmoidal cells.

Vertebral Bodies were infiltrated with same material as spongy parts of bones of head, having a dirty green colour.

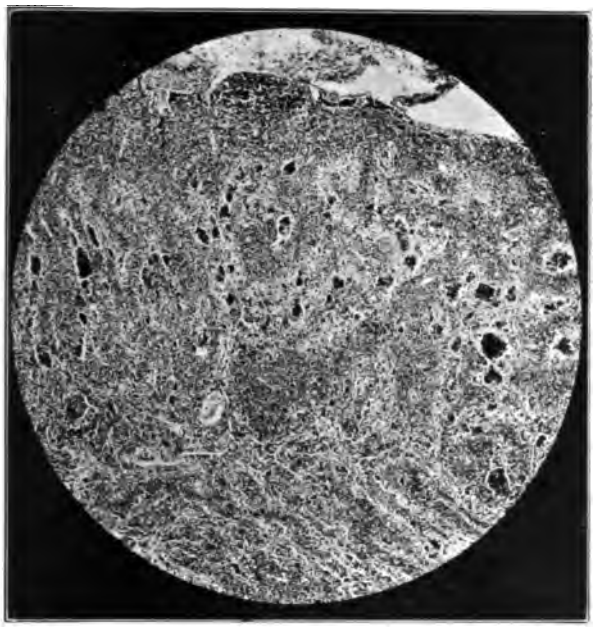

FIG. V.—Lymphatic gland. Case of chloroma. ×45 diam.

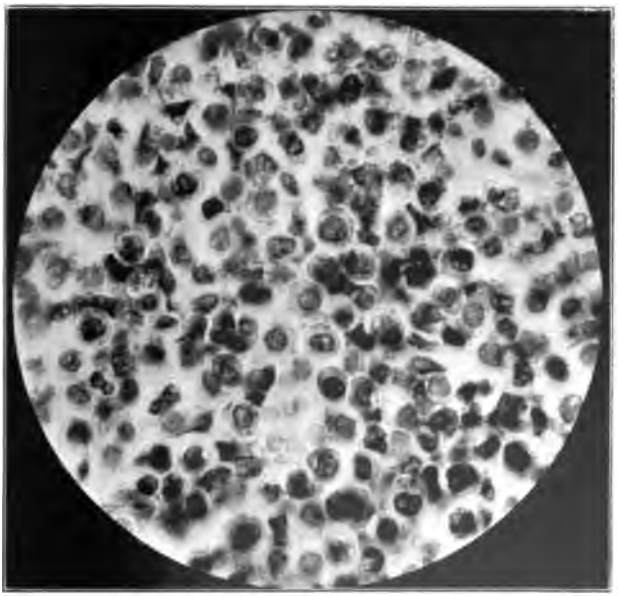

FIG. VI.—Bone marrow. Case of chloroma. ×450 diam.

TO ILLUSTRATE DR G. H. MELVILLE DUNLOP'S PAPER.

Femur.—The periosteum was of a bright green colour, most intense posteriorly. The fatty marrow had evidently disappeared, and its place been taken by greenish pus-like material.

On the day following the necropsy the colour in all the tissues and organs removed from the body, and which were preserved in formalin solution had disappeared; but on subsequent treatment with reducing agents the colour partially returned, indicating the presence of an oxidisable pigment.

Microscopic Examination

Orbital and Temporal Tumours.—These are composed of a closely arranged fasciculated connective tissue stroma, the spaces of which are packed with cells of uniform size, round in shape, or altered, either from mutual compression or to fit the spaces containing them. The great majority of these cells correspond in size and structure to the large lymphocyte. This cellular tissue penetrates the muscle, dividing up its bundles and separating individual fibres. It also infiltrates the neighbouring fat. Scattered amongst the cells are rounded clusters of granules which stain faintly both with osmic acid and sudan iij, and are refractile. They disappear when the sections are treated with solvents of fat, for example, alcohol, xylol, or benzol, hence are evidently of a fatty nature. In all the tissues and organs examined the same cells appear even when no evidence of their presence existed to the unaided eye. They pack the intervesicular walls and septa of the lung, causing them to appear thick. The portal spaces and fissures of the liver are crowded with cells which also appear between the columns of liver cells in the lobules. The kidney contains rounded areas in which the tubules are widely separated by the cells, an appearance corresponding to that sometimes seen in leukæmia. The tubular epithelium is cloudy and fatty. The sinuses and pulp of the spleen are full of the cells which dominate the field microscopically.

Lymphatic Glands.—The enlarged green glands from the neighbourhood of the head of the pancreas were examined microscopically. Their sinuses contain dense plugs of cells which *en masse* appear more deeply stained than the rest of the gland.

The lymphoid tissue in the walls of the *intestine* throughout is increased, and clusters of the cells are seen deep in the submucous coat.

The *bone marrow* practically consists of round cells, with rounded nucleus and fair amount of protoplasm corresponding to the cells found in other organs. The sections seem to indicate that the colour is due to the peculiar clusters of fatty nature, and possibly, in addition, to the presence of an oxidisable pigment. The theories of refraction due to arrangement of the cells and of decomposition seem untenable because in the case of the former the colour would not be lost post-mortem, and in the latter case it would increase, at least in the deeper parts.

LITERATURE

The case which I have here described is a very typical one of the disease, both in the symptoms manifested during life and in the post-mortem appearances. Chloroma is an exceedingly rare condition; many of the encyclopedias and recent works on pathology do not even mention the subject, and I have only succeeded in finding the records of twenty-seven recorded cases.

The first case was recorded by Alan Burns (1) in his "Observations on the Surgical Anatomy of the Head and Neck," in 1823, who regarded it as a condition differing from any morbid affection hitherto described. He considered that the new growth originated in the lachrymal gland, and was propagated secondarily to the other regions of the head and body. Following Burns, the earlier cases were recorded by Balfour (2) of Edinburgh, Mackenzie (3) of Glasgow, Durand-Fardel (4) of Paris, King (5) of Glasgow, and Dittrich (12) of Prague, between 1836 and 1855, while more recently Dock (6) of Michigan and Gustav Lang (7) of Nancy have written exhaustive monographs on the subject.

PATHOLOGY

The tumours have been variously described as green cancer, fibroplastic tumours, amorphous fibrous tumours, pigmented myxo sarcoma or chloromyxo-sarcoma.

Huber (8) defines this condition as a metastatic periosteal sarcoma, a definition which was confirmed by many subsequent

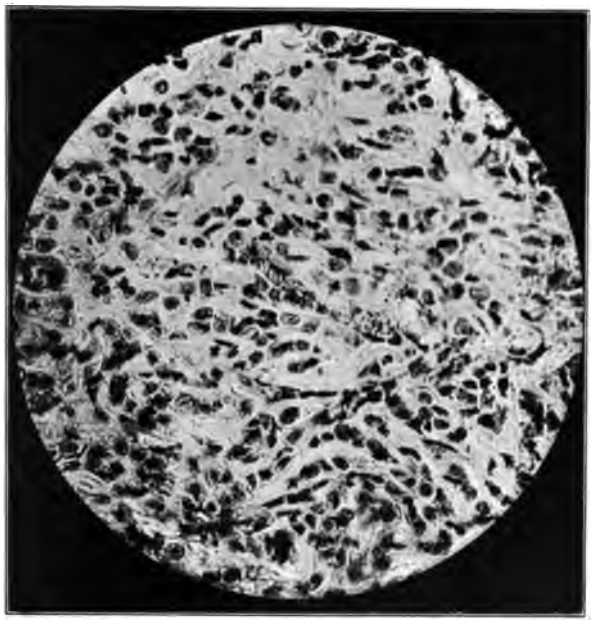

FIG. III.—Tumour. Case of chloroma. × 300 diam.

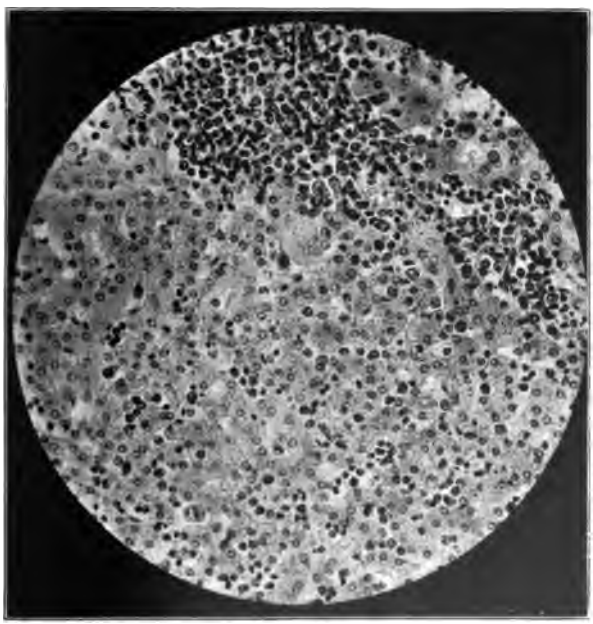

FIG. IV.—Liver. Case of chloroma. × 200 diam.

TO ILLUSTRATE DR G. H. MELVILLE DUNLOP'S PAPER.

observers. He maintains that the tumours always originate in the bones of the head and face, and that the growths in other organs are secondary and originate by metastasis. Recklinghausen (9) in 1883 pointed out that the tumours found in cases of chloroma differed in many respects from periosteal sarcomas, chiefly in their deficiency of bone formation and in their development from the outer layer of the periosteum. He insists upon the intimate relationship which exists between this affection and leukæmia. He demonstrated that the structure of all the tumours in his case was of a pure lymphomatous character, and in this belief he is supported by Höring Dock (10) and Chiari (11) and several other writers, with the result that the growths are now pretty generally regarded as belonging to the class of tumours known as lympho - sarcomas. Lympho-sarcoma is probably the best definition of the growths found in chloroma resembling on the one hand lymphonas in their histological structure and sarcomas in the fact that they arise from the periosteum and that they spread by metastasis. Recently the view has been advanced by Cordua and Ricker that a very close relationship exists between lympho-sarcomas and tuberculosis.

Colour.—Regarding the cause of the colour of the tumours, which varies from a yellowish green to a bright grass-green, considerable diversity of opinion has prevailed, and the question is by no means satisfactorily settled yet. Balfour thought the colour was due to bile pigment, but no trace of bile has ever been discovered in any of the tumours examined. Dittrich (12) supposed that the colour was the result of decomposition, but this theory is quite untenable, as the green colour is confined to the tumour growths, the other tissues of the body remaining unaffected. Portions of the tumours removed during life have a green colour, and there is a very decided difference between the bright grass-green colour displayed by chloromas and the dirty green of decomposition. Huber made an elaborate series of investigations on fresh tumours to discover the source of the colour, which he ascribed to minute molecular granulations possessing great refractile power and of great brilliance placed in and between the cells, and which he considered communicated an intense colour to the tumours. He believes that the colour is due to the massing of cells while the cells singly are colourless. Virchow (13), Dressler (14), and Chiari are at one with

Huber in considering that the colour proceeds from these adipose granulations found in and between the cells. It is still undecided whether the granules can be regarded as true fat granules, or only as an organic combination into which fatty acids enter. The colour quickly disappears from periphery to centre on exposure to air, or on immersion of the tumour in water, alcohol, chloroform, or ether. It is preserved for some days in glycerine and water, and it resists the action of acetic and hydrochloric acid for some hours. Waldstein's idea of the origin of the pigment is that it is a derivative of the blood pigment; but opposed to this view are the facts that it is present in tumours where no signs of extravasation have been detected. Finally, Dock, in giving his adherence to the fatty theory of the colour, considers that it is simply an exaggeration of the greenish tint so common in the neoplasms of leukæmia, and which he maintains is another proof that these conditions are closely allied. In view of the quick disappearance of the colour on exposure to air and on immersion in fluids that have no solvent influence on fats, the theory of the fatty granules being the cause of the colour appears to be a little difficult of acceptance, and it seems to me that the colour is more probably due to some chemical product allied to lipochrome hitherto undiscovered, which on exposure to light becomes oxidized and in the process of oxidation loses its colour.

Origin of Tumours.—It is pretty generally admitted that the tumours originate from the periosteum of the head and face, and that the growths met with in other organs are of secondary formation. Behring (15) believes that they generally arise in the ethmoid bone, and that infection is carried by the venous sinuses. Sauterau (16) and Landolt think that the growth usually originates in the lachrymal gland, and that it differs from other tumours of that gland in afterwards invading the sides of the orbits, the cranial dura mater, and distant parts of the body.

Metastasis.—All are agreed that the tumours subsequently invade the cavities of the skull, the marrow of the bones and the internal organs having a very rapid generalisation and multiple metastasis in the body. Nearly every organ has been invaded in the cases recorded by secondary growths, with the exception of the nervous system, which forms a very striking exception to this rule. It is a striking fact

that neither the brain nor the cranial nerves have been affected, although lying in closest proximity to the primary tumour. Huge tumours frequently completely fill the orbits, and are traversed by the optic nerves, which are found quite unaltered in structure. The brain may be, and frequently is, compressed, owing to pressure, but its substance is never invaded by the new growth. The kidneys of all the internal organs are the most frequently affected and infiltrated by the new growths. They most usually infiltrate the cortical portion of the kidneys, in large numbers, and owing to their bright green colour and small size give a mosaic appearance to the cut section. As Lang remarks, the tendency of the kidneys to suffer so frequently is probably due to their very active venous and arterial supply. I have only been able to discover the record of another case besides my own in which the muscular substance of the heart has been infiltrated.

The most characteristic pathological changes are to be found in the osseous system, which is irregularly destroyed at the site of the tumour, and in several recorded cases the bones were so thin as to be transparent. The changes are most pronounced, and always first detected in the bones of the head, commencing as a rule in the orbit, ear, nasal fossa, and temporal regions, and spreading subsequently to the periosteum of other parts of the head, and to the dura mater. In the majority of cases green tumours have been found filling the orbits, infiltrating the lachrymal glands, the fat, and the connective tissue, and causing projection of the eyeballs, and tumours of a similar description are frequently found occupying the temporal fossæ and replacing the temporal muscles, of which no trace can be found. The nasal fossa, the ethmoid sinuses, and the petrous portion of the temporal bone are frequently infiltrated with those green-coloured growths.

In the case recorded by Durand-Fardel a tumour was found in the auditory meatus completely filling the tympanic cavity. In King's case tumours were found in the mastoids and also in the inferior maxillary bone.

In the case recorded by Balfour green tumours of a cartilaginous nature were found under the scalp in the neighbourhood of the frontal, coronal, and sagittal sutures firmly adherent to the bone, and on removing the skull-cap similar tumours were found attached to the dura mater, which

had caused absorption and honeycombing of the inner table of the skull. This erosion or pitting is a marked feature in many of the cases. The dura and pericranium are generally most acutely infiltrated with the green colour corresponding to the site of the suture.

In many cases the periosteum of the long bones is of a bright pea-green colour, and the marrow is transformed into a semi-liquid green material resembling pus, both of which conditions were well-marked in my case.

Consistence.—The consistence of the tumours varies considerably, according as they are associated with fibrous, muscular, or osseous tissue. Sometimes they are soft, gelatinous, and elastic, exuding a greenish juice, and described by Balfour as resembling blancmange stiffened with isinglass, while at other times they are hard and cartilaginous, having almost the consistence of schirrus tumours. The cut surface is homogeneous with or without fibrous septa, and no trace of blood vessels is to be seen.

Microscopic Appearance.—The tumours are found to consist of large round or oval-shaped cells, a little bigger than a white blood corpuscle, containing numerous nuclei and occasionally nucleoli. These cells are either embedded in an intercellular amorphous material of a very clear and transparent character or in a delicate network, while at other times the tumour is interspersed by coarse bundles of connective tissue forming lines of demarcation. In the midst of this network the granules with the highly refractile properties already referred to are found lying in and between the cells.

Age.—Chloroma appears to be chiefly a disease of children, and adolescents, the great majority of cases occurring under fifteen years. Of the twenty-seven cases which I have collected, sixteen cases were under fifteen years, seven cases between fifteen and twenty years, three cases above thirty years, while the age of one case was not given.

Sex.—Boys seem to be more liable to be attacked than girls, for, out of the twenty-seven cases referred to, nineteen were males and only seven females, while the sex of one case is not recorded.

Relationship to Leukæmia.—Recklinghausen was the first to point out the very close resemblance between chloroma and leukæmia. He called attention to the lymphomatous structure

of the new growth, to the condition of the blood in the cases in which it was examined, and to the organs affected, either primarily or secondarily, by chloroma, which are identical with those found in cases of leukæmia. Dock, in his article on the subject, points out a further resemblance in the similarity of some of the symptoms of the two conditions. Thus, deafness is common to both. In chloroma it is due to the pressure of tumours in the internal, middle, and external ear. In leukæmia, though sometimes ascribed to hæmorrhage, in many cases it is caused by the pressure of leukæmic tissue in the ear. Exophthalmos is one of the most usual symptoms in chloroma, and a similar condition has been described in several cases of leukæmia. In both conditions anæmia of a marked and progressive nature is present, accompanied by petechiæ, extravasations under the skin, epistaxis, and hæmorrhages into the conjunctivæ and retinæ. The blood in every case of chloroma examined has been characterised by a very striking lymphocytosis and by a remarkable diminution in the red blood corpuscles. Dock is of opinion that in the rapidity of its course chloroma stands between ordinary cases of leukæmia and those described by Ebstein as acute leukæmia, a view which still requires confirmation. He considers that there is as strong evidence in favour of the new growths found in chloroma being the source of the lymphocytes as there is of the thymus, bone marrow, and spleen being their source in leukæmia.

Diagnosis.—So far as I have been able to gather, the case which I have recorded is the first in which a diagnosis of the condition was made during life. Before the appearance of the tumours a diagnosis would be impossible, as we have then only the symptoms pointing to leukæmia to guide us in forming an opinion—namely, the anæmia, loss of strength, rapid pulse, hæmorrhage into the skin and mucous membranes. When subsequently to those symptoms, exophthalmos, failing sight, deafness, tumours in the temporal regions, and other parts of the body supervene, the diagnosis of chloroma should always suggest itself.

Prognosis.—The termination is invariably fatal from exhaustion, the average duration of the case being five or six months, although cases have been recorded by Balfour and Durand-Fardel lasting two years and longer.

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2. NOTES OF A CASE OF CHLOROMA AND OF THREE CASES OF LYMPHATIC LEUKÆMIA

By BYROM BRAMWELL, M.D., F.R.C.P.Edin., Physician to the Edinburgh Royal Infirmary, etc.

SEEING Dr Dunlop was to bring his case of chloroma before the notice of the Society this evening, I thought it might be well to take the opportunity of recording a case of that rare disease which came under my observation last summer, and also of briefly referring to some other cases of lymphatic leukæmia — a condition which seemed to be very closely related to chloroma. As the time which the secretary has placed at my disposal is limited, I will content myself with briefly recording the more important clinical and pathological facts and making a few remarks on the nature of chloroma and its relationship to lymphatic leukæmia.

CASE I.—*Chloroma, with numerous lymphoid deposits resembling melanotic sarcoma in the skin, and lymphoid infiltrations producing great swelling of the gums, conjunctivæ, tonsils, epiglottis and larynx; no anæmia; no excess of white corpuscles in the blood, but* 95 *per cent. of the leucocytes, lymphocytes, mostly of the large variety; enlargement of the spleen and liver; fever, very quick pulse, etc.*

The patient was a married man, aged 25, a teacher of music. He was sent to me by Dr Douglas, of Cupar, on 22nd May 1901. Dr Douglas recognised that the case was a very remarkable one and suggested that it was perhaps a peculiar form of Hodgkin's disease.

Complaints.—The patient did not admit that he was ill; his only complaints were soreness of the mouth due to the swollen condition of his gums; slight deafness, more marked in the right than in the left ear; and an eruption on the skin. But on questioning him, I ascertained that he was markedly debilitated; that his voice was hoarse; that he had frequent cough; that he had difficulty of breathing; and that he had lost a considerable amount (more than one stone) in weight.

Previous History.—He stated that until this illness commenced he had never been ill, and that he knew no apparent cause for the condition. He had been married for four years; had one healthy child; and had never suffered from any form of venereal disease. His circumstances and surroundings were in every respect satisfactory.

The family history was excellent with this exception, that his father, aged sixty-seven, had two years previously been operated upon for what was thought to be a rodent ulcer.

The present illness seemed to have dated back to *October* 1900. At that time he one day accidentally discovered, whilst shaving himself, a hard, painless, movable lump about the size of a cherry (an enlarged gland) on the left side of the neck just below the angle of the jaw. *A week later* he discovered a similar lump on the corresponding point on the right side of the neck. *During the next six weeks* several other glandular swellings developed on each side of the neck. *In December* 1900 he had an attack of dyspepsia for which he called in Dr Creichton, who was at that time acting as *locum tenens* for Dr Douglas who was at the front, and took the opportunity of directing his attention to the glandular swellings, one of which was at that time as large as a hen's egg. Dr Creichton considered that the swellings were tubercular and prescribed some medicine and ointment for them. *During the next two months* the swellings subsided but did not entirely disappear. *At the beginning of January* 1901 the patient noticed some white spots about the size of a pea on the front of the chest; they were, he said, exactly like the marks produced by the sting of a nettle. *During the month of February* he suffered for a fortnight from pains in the back which were thought to be rheumatic in character. These pains subsided in the course of a few weeks under treatment. *In the middle of March* 1901 he felt quite well, but there were still some glandular swellings on each side of the neck, and the eruption, which was at first limited to the chest, had extended over the chest, abdomen, back and arms; there were also a few spots on the face and legs. *At the beginning of April* the eruption became of a leaden purplish colour. *During the third week in April* the patient thought he caught cold while playing the organ at an opera. He was seated just below the platform and was much disturbed by the warm draught from the stage playing on to his face. The next day he noticed that his face was swollen. His gums then became sore and swollen and his eyes watered. Soon after this his voice became hoarse and husky and he had difficulty in breathing through his nose. The spots on the skin continued to increase and extend.

In May he consulted Dr Douglas, who had returned from the front, and was sent by him to me.

Present Condition.—His condition on *May 22nd*, 1901, was as follows:—

He was naturally a fair-haired, blue-eyed, well-nourished, ruddy-complexioned man. The face was swollen and puffy, but there was no exophthalmos. Some hard, painless, enlarged glands were present on each side of the neck and below the angle of the jaw. Both parotids appeared to be enlarged. There was some symmetrical swelling in each temporal region. The swelling of the face appeared to be partly due to the presence of nodular swellings in the skin and subcutaneous tissues, partly to œdema, and partly to the glandular swellings already described.

The voice was markedly husky, the breathing attended with some stridor, and there was frequent cough. The patient was distinctly deaf, more particularly in the right ear. The pulse was quick (120-130), and the temperature slightly elevated.

A very remarkable eruption was present over the greater part of the body. It was most abundant on the thorax, abdomen, back, on the upper extremities, especially on the extensor aspect, and on the face and scalp; it was scanty no the legs, very few spots being present below the knees. The eruption consisted of flat-topped, firm nodules which varied in size from a pin's head to a sixpence or even larger; in many cases the nodules were confluent, producing a uniform infiltration of the skin. For the most part the nodules were of a slaty-grey or bluish-purple colour, but in places, more particularly in their centres, they were yellow. The nodules were freely movable, not adherent to the deeper parts, and painless.

The gums presented a very remarkable appearance—they were very greatly swollen almost completely burying the teeth. The gum of the upper jaw measured $\frac{7}{8}$ of an inch in thickness; that of the lower jaw $\frac{5}{8}$. The swollen gums were of a dark purple colour, their free surface presented a nodulated and granular appearance; they were tender and inclined to bleed, but of firm consistency; they did not resemble the spongy gums of scurvy. The breath was fœtid. The right tonsil was markedly swollen and of a deep purple colour.

The conjunctiva also presented a remarkable appearance, it was infiltrated apparently with a new growth of a fleshy appearance and consistence, in which dilated vesels could be seen ramifying.

There was no exophthalmos; the sight was unaffected; and the optic discs were normal.

The lips and mucous membranes were not anæmic and the blood on microscopical examination appeared to be normal; there did not appear to be either a diminution of the red corpuscles or an excess of the white corpuscles (on this day—22nd May—the blood was not counted and no films were made).

The splenic dulness was increased, but the spleen could not be felt below the ribs. The liver was somewhat enlarged.

The heart, lungs and urine were quite normal.

I came to the conclusion that the case was probably one

of melanotic sarcoma; the idea of leprosy also occurred to me, but was rejected for various reasons. But the diagnosis presented so much difficulty and the case was so peculiar that I suggested to Dr Douglas that the patient should be admitted to the Infirmary in order that his case might be carefully studied and investigated and with the object of seeing what could be done in the way of treatment. Dr Douglas agreed with this suggestion.

The patient was consequently admitted to Ward 28 on the 23rd May 1901; he remained in the Infirmary until 24th June, when death took place.

After his admission to the Infirmary, he was seen by Dr Allan Jamieson, who (without knowing my opinion) came to the conclusion that the case was probably one of melanotic sarcoma; the idea of leprosy also occurred to Dr Allan Jamieson. The case was shown to my Clinique, and three senior students suggested melanotic sarcoma, no other opinions as to the nature of the case being given.

In order to verify the diagnosis, nodules from the skin were excised by Dr Gulland and Dr Welsh. The result of the microscopic examination was to show that the case was not one of melanotic sarcoma, but that the nodules were composed of uninucleated lymphoid cells; there did not appear to be any pigment in the nodules.

The examination of the blood showed the following conditions:—

The red corpuscles numbered 4,480,000 per cubic millimetre, the hæmoglobin equalled 72 per cent., and the white corpuscles numbered 8000 per cubic millimetre. Some of the red corpuscles showed a certain but not marked degree of poikilocytosis and chromatophilia, a few normoblasts were seen.

The white corpuscles were found to consist almost entirely of lymphocytes. The *differential count* (as determined both by Dr Gulland and myself) was as follows:—

Polymorphs . . .	5	per cent., or less.	
Eosinophiles . . .	0·5	„	
Lymphocytes . .	94·5	„	or more.
	100·		

The lymphocytes which constituted 95 per cent. or more of the total leucocytes were for the most part of large size, containing a large feebly staining nucleus surrounded by a comparatively thin layer of clear protoplasm without granules.

Dr Welsh kindly examined the blood for micro-organisms, both by staining films and by incubating sterilised gelatine. The result was entirely negative. No micro-organisms were found in the blood.

The condition of the blood was very interesting and important. There was no anæmia and no excess of the total number of the white cells in the blood, but the differential

count showed that 95 per cent. of the white corpuscles which were present in the blood were lymphocytes, and most of them large lymphocytes.

Now, so far as I know, lymphatic leukæmia is the only condition in which the blood presents these characters (95 per cent. or more of the white corpuscles being lymphocytes). But if it be granted that chloroma is a distinct disease, and not merely a variety of lymphatic leukæmia, then one must grant that in chloroma the blood may present the same characters as in lymphatic leukæmia (95 per cent. or more of the white corpuscles being lymphocytes); in other words, one must grant that the fact that 95 per cent. or more of the white cells are lymphocytes is not pathognomonic as is usually supposed of one disease only, viz. lymphatic leukæmia, but that it may occur in two separate and distinct diseases, viz. lymphatic leukæmia and chloroma. I will return to this point later.

The diagnosis arrived at, then, as the result of the examination of the excised nodules in the skin and of the blood was, that the case was not melanotic sarcoma, but that it was lymphatic leukæmia—a very peculiar form of lymphatic leukæmia, in which there was a remarkable infiltration of the skin, gums, tonsil and conjunctivæ with lymphoid deposits.

A number of cases of leukæmia of the skin have been described. They have recently been collected together in the form of a monograph by Dr L. A. Nekam (*Uber die Leukæmischen Erkrankungen der Haut*). A case very similar to the present case has recently been recorded by Professor George William Wende in the *American Journal of Medical Sciences*, Dec. 1901, p. 836.

The condition of the gums, epiglottis and larynx which was present in this case was also quite new to me.

The subsequent progress of the case was as follows:—The condition of the blood remained, practically speaking, the same; the red corpuscles underwent some, but not a marked, diminution (the lowest count was 3,600,000); the white corpuscles increased to some, but not to a marked, extent (the highest count was 13,000); the differential count showed that 95 per cent. or more of the white corpuscles continued to be lymphocytes, mostly large lymphocytes.

The swelling of the face, gums and conjunctivæ increased. The lymphatic nodules in the skin increased in size, and many fresh nodules appeared on the face, limbs and other parts of the body. On the face,

thorax, abdomen and upper extremities, the colour of the nodules changed, becoming yellow or yellowish-green; one or two of the nodules on the face became distinctly green. The nodules on the lower extremities and the more recent nodules on the other parts of the body presented the original slaty-purple hue.

In their earliest stage of development—and the development and growth of several new nodules was carefully followed on the skin of the lower extremities—the skin lesions presented the appearance of minute hæmorrhagic extravasations, which subsequently became well-defined, firm, flat-topped nodules of a slaty-grey colour.

During the month that the patient was under observation in hospital, the temperature was elevated (highest 104° F.); the pulse remarkably quick (varying from 110 to 160); and the respirations increased in frequency (25 to 35). The rapid course of the case, the continued pyrexia and the very quick pulse were highly suggestive of some form of intoxication; but, as I have already stated, no micro-organisms were found in the blood. The peculiar mouth lesions suggested that the buccal cavity or tonsils was the source of the intoxication.

The breath was foul; the gums bled from time to time, but not to any great extent; the difficulty in breathing, stridor and cough increased. The patient became more and more debilitated.

He died on 23rd June 1901—a month after his admission to the hospital. The nurse who was present at the time of death remarked that he was quite conscious until the very end.

A post-mortem examination was obtained with difficulty and only on the proviso that the head and face should not be examined. It was very unfortunate that this proviso was imposed for it precluded the examination of the orbital cavities and skull bones—the situations in which the most characteristic lesions of chloroma are found.

All of us who were present at the post-mortem examination noticed the green colour which the nodules in the skin of the face, trunk and upper extremities presented; whereas the nodules on the lower extremities were of a slaty-purple hue (in Dock's case of chloroma the lesions also became much more green after death).

Some of the glands in the neck were green, the tonsils were green, the epiglottis and laryngeal mucous membranes were green.

The skin was infiltrated with innumerable lymphoid deposits.

The lymphatic glands on both sides of the neck and about the jaws were considerably enlarged. The gums were enormously enlarged and ulcerated. The tonsils, especially the right tonsil, were much enlarged and ulcerated; the epiglottis was much swollen; the laryngeal mucous membranes were greatly swollen.

Microscopic examination subsequently showed that the deposits in the skin, and the swelling of the gums, conjunctivæ, tonsils, epiglottis and larynx were due to infiltration with uninucleated lymphoid cells identical in character with the large lymphocytes found in the blood during life.

The spleen and liver were somewhat enlarged.

The lymphatic glands in the thoracic and abdominal cavities, in the axillæ, and in the groins were hardly at all affected—a few of them only being slightly enlarged.

The kidneys were in places infiltrated with lymphoid deposits; but there were no green deposits on the kidneys.

The bone-marrow of the ribs contained some but not very numerous lymphoid cells similar to those in the skin, gums and blood.

Dr Macdonald's Report of the Post-mortem Appearances

Dr Macdonald has kindly given me the following abstract of the post-mortem appearances:—

External Appearance.—Greenish pallor of skin; numerous nodules throughout skin, with distinct dark greenish colour.

Right lung = 1 lb. 11½ oz. Some sub-pleural petechiæ and recent fibrin over lower lobe. On section, hæmorrhagic areas throughout and some broncho-pneumonic consolidation over lower lobe and middle lobe; rest of lung acute congested and œdematous.

Left lung similar. *A few small* pigmented bronchial glands; largest bronchial gland ½ by ¼ in.

Heart = 13 oz. Numerous epicardial petechiæ; no endocarditis; valves competent; myocardium very pale and flabby; well marked fatty degeneration.

Spleen weighed 9 oz.; measured 6 in. by 1½ by 1¾; very soft; no nodules; perisplenitis; Malpighian bodies evident; dark pigmented areas towards surface; appears to be some thickening of stroma.

Liver = 4 lb. 12 oz. Pale, flabby; lobules unduly well outlined; an appearance of minute hæmorrhages in substance of organ; a *few* minute (less than small pin-head) pale nodules below capsule and throughout organ; no waxy disease.

Kidneys.—Left = 8 oz. Right = 7 oz. Cortex increased in size, general pallor of organ. Bases of pyramids widened out as if from infiltration; glomeruli prominent; no hæmorrhages; no nodules; cloudy; early catarrh; some fatty degeneration.

Pancreas = 4 oz. Pale, firm.

Mouth and Pharynx.—Necrotic ulceration specially marked in left tonsil and round the gums, which are greatly swollen, soft and friable. Great enlargement of *lingual tonsil.*

Thyroid and thymus show nothing abnormal.

Larynx.—Ulceration of epiglottis and marked thickening and infiltration of all the tissues in region of the larynx.

Stomach and intestines show nothing abnormal. No increase in lymphoid tissue in intestine.

Mesenteric glands show nothing abnormal.

Other glands in body.—A few enlarged glands in neck on both sides; largest about ¾ in. long; a few in right axilla and just at bifurcation of right common iliac; most of these in neck and axilla are firm and white; iliac glands softer and show some hæmorrhages.

Microscopical Examination

Lungs.—Acute broncho-pneumonia with hæmorrhage.

Spleen.—Infiltrated with small lymphoid cells, not specially marked; marked hyaline degeneration of vessels.

Kidneys.—Cloudy swelling and early catarrh; small areas showing diffuse infiltration of lymphoid cells between tubules; slight fatty degeneration

Bone-marrow.—Examination of femur not permitted; marrow of rib dark red.

Glands of neck show some fibroid change. *Iliac glands* show some areas of hæmorrhage.

Liver.—Nothing special.

Nodules in *skin, gums, palate,* infiltrated with lymphoid cells.

No organisms discovered in the tissues.

After the post-mortem examination, I came to the conclusion that the case was one of chloroma—I remembered having read some years previously a very interesting paper on chloroma and its relationship to lymphatic leukæmia by Professor George Dock in the *American Journal of Medical Sciences.* On looking up Dr Dock's description, I had no doubt that my case was one of chloroma. The same idea—that the case was one of chloroma—had also independently occurred to Dr Shennan; he mentioned it to me a few days after the post-mortem; and I then told him of Dr Dock's paper.

I was fortunate in meeting Dr Dock at the Tuberculosis Congress in London and also subsequently in Edinburgh, during the month of August, and of having the opportunity of discussing the subject of chloroma with him. Dr Dock has made a special study of chloroma. He has very kindly sent me a number of references to recent cases and papers on the subject. He agreed with me in thinking that the case which I have related was one of chloroma. I was also fortunate in having the help and advice of Dr Gulland in the examination of this and the other cases which I will presently relate; and I am glad to avail myself of this opportunity of expressing my great indebtedness to Dr Gulland for much valuable assistance in working out the blood condition in this and numerous other cases. I have, too, to thank Dr Macdonald for his exhaustive examinations and reports on the pathological features of this and the next case.

The exact nature of chloroma and its relationship to lymphatic leukæmia is very uncertain and undetermined. But before referring further to these points, I will relate another case—a case of very acute lymphatic leukæmia—in which exactly the same conditions of the gums, tonsils, epiglottis, and larynx were present, as in the case which I have just related,

and in which, too, there were some, though not numerous, lymphoid deposits in the skin of the neck and back. In this second case, too, deafness was a marked symptom, and in it (although no blood count was made) there was no suspicion of anæmia during life, in fact the skin and mucous membranes were blue, turgid, and cyanotic. The two cases taken together seem to me to have an important bearing upon the relationship of chloroma and lymphatic leukæmia.

CASE II.—*Acute lymphatic leukæmia with a similar lesion in the gums, epiglottis and larynx to that which was present in Case I.*

The patient was a labouring man, aged 33. He was admitted to the Edinburgh Royal Infirmary on Saturday, September 29th, 1901, and died on Sunday, September 30th, 1901.

He complained of shortness of breath on exertion, of deafness, and of glandular swellings on each side of the neck and jaw.

The deafness had commenced a month previously, but he had followed his employment as a labourer until three days before his admission to the hospital.

He was a thick-set, well-nourished, muscular man. There was no anæmia, in fact his face and lips were turgid and cyanotic. No examination of the blood was made during life; but, after death, the blood was found to contain a large excess of lymphocytes, mostly of the large form. The patient was very deaf. His voice was husky and almost toneless, he was very short of breath, and the respiration was attended with stridor. Large, hard, painless glandular swellings were present on each side of the neck, especially marked about the angle of the jaw; the face was swollen and blue; the veins of the neck somewhat engorged. I saw him for a moment on his admission to hospital, but had not the opportunity of making an exhaustive examination of the case; I thought that the difficulty of breathing and stridor and turgescence of the head and face were probably due to enlargement of the mediastinal glands, with resulting intrathoracic pressure. After the patient was put to bed, the case was more carefully examined by Dr Montgomery Bell, who was temporarily acting as my house-physician. The chest was full of bronchitis râles. The pulse numbered 108, the temperature was 102°, and the respirations 20. The tonsils were swollen and ulcerated. The patient died on the day following his admission to hospital. The nurse who was present at the time of death was so struck by the fact that she pointedly told me the next day that the end in this case was exactly the same as in the first case which I have related. Both patients had remained absolutely conscious until the last gasp.

POST-MORTEM FINDINGS

Dr Macdonald has kindly given me the following abstract of the post-mortem appearances:—

External appearance.—Faint greenish pallor as if from post-mortem change of face, neck and upper part of thorax.

Nodules in skin only on back of neck, shoulders and trunk; none on anterior aspect; vary in size from $\frac{3}{16}$ in. to small pin-head.

Mouth, pharynx and larynx.—Gums soft, friable, greenish in colour; teeth decayed; epiglottis and arytenoid-epiglottic folds greatly thickened, hiding the true cords; ulceration of side and tip of epiglottis; ulcer of œsophageal wall.

Tonsils.—Enlarged and ulcerated, especially on the right side; ulceration of tonsil shows a central black slough with greenish margins. Some enlarged glands in neck were distinctly green on section.

Other glands in body.—Enlarged, firm glands in submaxillary regions and in both groins; none exceed 1 in. in length.

Thymus distinctly enlarged.

Heart = 12½ oz. Sub-epicardial petechiæ. Myocardium soft, pale, swollen and pink; no obvious fatty degeneration. Blood shows nothing abnormal to naked eye.

Lungs.—Old pleurisy; old tubercle at apices; lungs dry and tough; no consolidation; a few small pigmented glands at both roots.

Stomach.—Petechial hæmorrhages at cardiac end.

Intestines.—Normal; no increase of lymphoid tissue.

Mesenteric Glands.—Enlarged, soft, pink.

Pancreas = 4½ oz. Soft and juicy, shows some small hæmorrhages.

Liver = 5 lbs. 5 oz. Pale, flabby and fatty looking.

Spleen = 14 oz. Dark red; some hæmorrhages; Malpighian bodies not evident; no nodules; no infracts.

Kidneys weigh 8 oz. each. Swelling and pallor of cortex; appears to be acute parenchymatous nephritis.

Suprarenals healthy.

Bone-marrow.—Increased in amount, dark red and gelatinous. No thickening of periosteum in front of the vertebræ.

Brain = 3 lbs. 8 oz. Soft, œdematous and congested; no hæmorrhages.

Retina.—Shows nothing abnormal.

Mid ears and orbits.—Normal.

Microscopically

Infiltration of all the organs and bone-marrow with large lymphocytes, specially well seen in spleen, myocardium, liver and thymus.

Kidney.—Acute nephritis and infiltrated with lymphocytes.

No organisms discovered in the tissues.

The post-mortem examination consequently showed that the case was one of acute lymphatic leukæmia. The glands throughout the body were enlarged; the spleen, liver and kidneys were infiltrated throughout with lymphoid cells; the bone-marrow was of a dark purple colour and infiltrated with lymphoid cells. In the skin of the back and neck there were several lymphoid deposits similar to those which were present in the first case. In this, the second, case, the condition of the gums, tonsils, epiglottis and larynx was identical with that which was present in the first case, with the exception that the parts were normally coloured, not green. Some of the glands in the neck, in the second case, were on section found to be green in colour.

This second case was without doubt a very acute lymphatic leukæmia. The post-mortem appearances were highly typical and characteristic. The blood (examined after death) presented the usual characters of acute lymphatic leukæmia.

The case is an interesting and important one because of (1) the great rapidity of its course (the patient had been deaf for a month but had worked as a labourer until three days before his death); (2) the absence of anæmia and cachexia; (3) the peculiar lymphoid infiltrations of the gums, tonsils, epiglottis, and, to a very limited extent, of the skin.

Now, these two cases when taken together have, I think, an important bearing upon the nature and pathology of chloroma.

As Dr Dunlop has told us, chloroma is a very rare disease, some five-and-twenty cases only having been recorded up to the present time. But it is probable, I think, that the disease is much more common than is usually supposed. Many cases are no doubt missed. A case figured in a recent number of the *Medical Review of Reviews* (November 1901, p. 695), and described as a "Rapidly growing tumour of the Orbit," was probably, I think, a case of chloroma. Some years ago, a friend in Barbadoes, sent me a photograph of a remarkable case of symmetrical sarcomatous growths of the orbits, with exophthalmos and huge infiltrations and projections of the conjunctivæ, that was probably a case of chloroma; it appears to be merely an exaggeration of the ocular condition in a case of chloroma recently published by Rosenblath (*Deutsches Archiv für Klinische Medicin*, 72 Band, 1 Heft., 1902). It was probable that some of the rare cases of so-termed perforating sarcoma of the skull, of which I reported an example a few years ago, are cases of chloroma.

In typical cases, the characteristic features of chloroma are as follows:—

(1) *The presence of lymphoid deposits in the orbits, temporal fossæ and periosteum of the bones of the skull, and the symptoms and signs resulting therefrom.*

In consequence of the lymphoid deposits in the orbits there is usually, but not always, exophthalmos; and often as the result, partly perhaps, of the pressure on the optic nerve and its vaginal sheath and partly of the altered blood condition (lymphatic leukæmia and anæmia), hæmorrhages in the

retinæ and optic neuritis. Lymphoid infiltrations of the conjunctivæ, which in some cases produce large protruding swellings, giving the appearance of sarcomatous outgrowths and fungations, sometimes occur. Lymphoid infiltrations of the cornea are also sometimes developed.

Firm bilateral swellings in the temporal fossæ are very often present.

The periosteal lesions are not confined to, though they are apparently always most marked in, the region of the skull and face. The periosteum of the bones of the vertebral column is often affected. In a recent case (Rosenblath's first case) the spinal column was eroded, the nerve roots and spinal cord pressed upon, and secondary ascending degeneration in the spinal cord developed.

Deafness is very common; it is apparently, in some cases, due to pressure on the auditory nerve, in others to lesions (involvement) of the middle or internal ear.

Facial paralysis due to pressure on the facial nerve is sometimes met with.

There is in many cases difficulty in breathing through the nose, the result of swelling and infiltration of the nasal passages.

The tonsils are often enlarged and infiltrated.

The remarkable swelling of the gums, epiglottis, and larynx which was present in the two cases which I have related, has not, so far as I have been able to find, been hitherto described—but I was much interested to find when Dr Dunlop kindly gave me an opportunity of seeing his case during life, that in his case the palate was swollen and infiltrated in exactly the same manner.

(2) *The green colour of the lesions* (lymphoid deposits in the orbits, periosteal lesions, lymphoid deposits in the kidneys, liver, spleen, bone-marrow, etc.).

This is a remarkable feature of the disease. In many cases the green discoloration was only noticed after death. But that the green colour, in some cases at least, is not due to post-mortem changes is conclusively shown by the fact that in some of the recorded cases the urine was green during life.

As Dr Dunlop has stated, the exact cause of the green colour is still unknown. In my own case the change in colour which the skin lesions went through during life was suggestive of a blood change, and the marked increase of the

green colour which was noticed at the post-mortem examination in the skin lesions *in the upper part of the body* seemed to me to be suggestive, in part at least, of a post-mortem (? decomposition) change.

The question naturally occurs whether in all cases of chloroma the green colour is due to the same cause. It is possible that it may be due to different causes in different cases. It is possible that the green tumours are not invariably due to one and the same pathological condition.

Further, though this may at first sight seem to be a contradiction in terms, it seems to me probable that cases of chloroma occur in which there are no green tumours and no green lesions. I am strongly disposed to think that the green discolorations, though they have hitherto been considered to be essential and characteristic features of the disease, may, in some undoubted cases of chloroma, be absent.

These questions require solution.

(3) *A profound blood change* characterised by anæmia, cachexia, hæmorrhages into the skin, bleedings from the mucous membranes, especially epistaxis, and petechial extravasations into the retinæ and internal surfaces (epicardium, etc.).

The same profound blood change is met with in most cases of acute lymphatic leukæmia, but it is certainly not always present. In the two cases which I have just described (Case I. Chloroma, and Case II. Acute Lymphatic Leukæmia) there was little or no anæmia and no cachexia.

(4) *The essential blood change in chloroma seems to be an enormous excess of the lymphocytes and especially of the large lymphocytes in the blood;* in short, in cases of chloroma the blood seems (? always) to present the characteristic features (95 per cent. or more of lymphocytes) which up to the present time are regarded as indicative of one condition only, viz. lymphatic leukæmia.

In all the recent cases of chloroma which have been examined exhaustively, the blood has presented the characters of lymphatic leukæmia. In some cases in which there was no excess of leucocytes, the character of the corpuscles had not been ascertained by the examination of stained films. Now, the first case which I have related shows that lymphatic leukæmia may be present when there is no excess of leucocytes.

In chloroma as in lymphatic leukæmia the glands, spleen,

and bone-marrow are always affected and the internal organs infiltrated with lymphoid deposits, though the relative extent of the lesions in the glands, spleen, bone-marrow, and other organs affected (infiltrated with lymphoid deposits) varied in different cases. Exactly the same thing is seen in lymphatic leukæmia.

The question whether chloroma is a definite and distinct disease or whether it is merely a variety of acute lymphatic leukæmia is a very difficult one to answer—a good deal can be said on both sides. The peculiar location of the lesions to the orbits and periosteum of the skull bones, though they are not, of course, confined to these parts; the green colour of the tumours; the fact that, in some of the recorded cases, the tumours were of cartilaginous consistency; and the fact that, in some cases (as in one of Rosenblath's recent) cases, the bones were eroded and perforated by the lymphoid growths are in favour of sarcoma or lympho-sarcoma rather than of lymphatic leukæmia.

But the condition of the blood is highly suggestive of lymphatic leukæmia.

The three cases which have been brought before the Society this evening seem to show that no hard and fast line can be drawn between acute lymphatic leukæmia and chloroma. Dr Dunlop's case is a highly typical case of chloroma with all the changes in the blood characteristic of acute lymphatic leukæmia. My second case is a typical case of very acute lymphatic leukæmia, with peculiar lesions in the gums, tonsils, larynx and skin; and my first case seems to stand midway between the two (Dr Dunlop's case and my second case). The mouth lesions seem to be the same in all three cases. The whole question seems to me to turn upon the nature and definition of lymphatic leukæmia. Possibly the same condition of blood (95 per cent. or more of the white corpuscles being lymphocytes) may result from more than one pathological condition. But, practically speaking, lymphatic leukæmia and chloroma—if it be allowed that lymphatic leukæmia and chloroma are distinct diseases—are the only known diseases in which, so far as we know, such a condition of blood is present. Probably more than one disease is included under the term acute lymphatic leukæmia, or, at all events, different varieties of the disease exist. But this point must necessarily remain

undecided until we know what the primary cause or causes of the condition or conditions included under the term lymphatic leukæmia are. Many of the features of the disease, notably the acute course and the fever, are suggestive of an intoxication, the poison or irritant leading to an overgrowth of—to the production of the characteristic lesions in—the bone-marrow, spleen and lymphatic glands. On this point I can add nothing to what I have already expressed in my book on "Anæmia and Diseases of the Blood," viz.:—"Ebstein's observations[1] show that in cases of acute leucocythæmia the onset is sometimes sudden, the course rapid and attended with considerable fever; hæmorrhages from the gums and nose sometimes occur; purpuric spots may be developed in the skin, and hæmorrhages may be poured out into the viscera or from the mucous surfaces; the lymphatic glands, spleen and liver enlarge; in some cases there is tenderness over the bones; the patient becomes profoundly anæmic and asthenic; the blood contains a large excess of leucocytes (the white corpuscles in some of the cases were said to be as numerous as the red); finally, the patient may sink into a typhoid state; or delirium, coma or convulsions may be developed.

"In the sixteen cases (all verified by post-mortem) which Ebstein tabulated and analysed, the average age was 29 years, the youngest patient being 5 years and the oldest 59 years; while the average duration of the disease was 5.8 weeks, the shortest duration being 2½ and the longest 9 weeks.

"In acute leucocythæmia unhealthy and rapidly-formed ulcerations in the mouth are of frequent occurrence, and are highly characteristic; ulceration in other parts of the gastro-intestinal tract may also occur.

"The clinical features and course of this acute form of leucocythæmia are highly suggestive of an infective process, and in some cases micro-organisms (staphylococci and streptococci) have been found in the blood during life, and in the organs after death. In a case recorded by Dr J. S. Fowler, a bacillus was present in all the blood films which were examined."[2]

Certainly different cases of lymphatic leukæmia present very great differences in regard to their clinical history and course and in regard to the relative intensity of the lesions

[1] *Deutsches Arch. f. Klin. Med.*, Leipzig, 1889, B. xliv. p. 343.
[2] *Edinburgh Hospital Reports*, vol. v., 1898, p. 13.

found after death in the bone-marrow, spleen and lymphatic glands respectively. The two cases which I will next relate illustrate this point.

CASE III.—*Very acute lymphatic leukæmia characterised during life by pains in the bones (suggestive of osteomyelitis), fever, rapidly developed anæmia, great excess of lymphocytes in the blood, petechial hæmorrhages into the skin and retinæ, epistaxis, very slight enlargement of the lymphatic glands, great enlargement of the liver and spleen, normal urine.*

The patient was a single man, a shepherd by occupation, aged 18½ years, who was admitted to Ward 28 on January 30th, 1902, and died on February 2nd, 1902.

He stated that he had always been very healthy and strong, and that, until three weeks before his death, he had been in good health, but the people with whom he lived had noticed that for some little time previously he had not been eating well and had not been quite so vigorous as usual.

Three weeks before his death, he was one day, while at work, suddenly seized with an acute pain in the lower end of the left femur; a few days later he experienced pain of a similar kind in the bones of the right ankle and left elbow. The affected bones were tender on pressure. The doctor who was called in to see him thinking the condition was probably due to osteomyelitis, sent him into the Royal Infirmary under the care of Mr MacGillivray. There was some fever. The patient rapidly became profoundly anæmic, and Dr Gulland, who had been asked to examine the blood, found that the case was one of acute lymphatic leukæmia. The patient was consequently transferred to my care, and I am indebted to Dr Gulland for giving me the opportunity of bringing the case before your notice this evening.

The patient was admitted to Ward 28 on January 30th and died on February 2nd, the total duration of the illness being exactly three weeks.

The patient, who was naturally of very fair complexion, was profoundly anæmic. On the evening of his admission to Ward 28, there was some epistaxis; the amount of blood lost was estimated at two ounces.

The red corpuscles numbered 3,000,000 per cubic millimetre, the white corpuscles 56,000 per cubic millimetre, and the hæmoglobin equalled 40 per cent.

The differential count showed that 98 per cent. at least of the white corpuscles were lymphocytes, mostly of the large variety. It was difficult to find any polymorphonuclear lymphocytes in the films. There were no eosinophile cells. A few nucleated red corpuscles, both normoblasts and megaloblasts, were present.

Dr Macdonald, who kindly examined the blood for micro-organisms on February 1st (the day before the patient's death), obtained a pure cultivation of the streptococcus.

There were numerous small petechial hæmorrhages on the neck, trunk and limbs; and several hæmorrhages in the retinæ.

The gums and buccal mucous membranes were very bloodless-looking, but otherwise quite normal. The teeth were good. The tonsils were not enlarged. There was no difficulty in breathing and no suspicion of any infiltration of the larynx.

A few enlarged glands were present in the neck, axillæ and groins; but they were difficult to detect and were only noticed after being carefully looked for.

The spleen was much enlarged; it extended for two inches below the costal margin.

The liver was also markedly enlarged, its lower border reaching to within an inch of the umbilicus.

The pulse was rather slow (60); the temperature 100° F.; the respirations number 20 per minute.

The *urine*, which was carefully examined on three separate occasions, was very pale; sp. gr. 1010 to 1012; it deposited a heavy mass of white (colourless) urates; it contained no albumen and no blood.

On February 1st the temperature began to rise, and epistaxis occurred and continued notwithstanding treatment (adrenalin, hamamelis, etc.) for some hours.

The patient died on February 2nd at 4 A.M.

The *post-mortem examination* was made on February 3rd by Dr Macdonald. The body was profoundly anæmic. Numerous petechial hæmorrhages were present on the skin and some in the retinæ; none on the epicardium or in the viscera, with the exception of the kidneys.

The muscles throughout the body had a peculiar bright lake-red colour.

The spleen was very much enlarged; of a dark purple colour and moderately firm in texture—very different from the soft defluent spleen of an acute septic (febrile) condition.

The liver was very much enlarged; of a bright pink colour, and on section looked fatty.

The lymphatic glands were only very slightly affected. There were some enlarged glands in the neck, axillæ, groins and abdominal cavity —but the enlargement was only slight and the affection of the lymphatic glands was a most inconspicuous feature of the case.

The bone-marrow was profoundly altered—of a dark brick-red colour, fairly firm and fleshy in consistency, completely filling the shaft of the femur, etc.

The kidneys were both greatly enlarged, the right weighed 18 and the left 14 ozs. Both organs looked as if they were infiltrated with deposits of melanotic sarcoma. The cortical substance was the seat of numerous dark hæmorrhages, many of them of large size; the intervening kidney substance was very pale and exactly resembled very anæmic and œdematous brain tissue.

The bladder contained 14 ounces of urine, which was drawn off by a catheter and carefully examined. It was very pale in colour, sp. gr. 1012, it was absolutely free from blood, and contained the merest trace of albumen (which was perhaps a post-mortem addition, for the urine contained some floculli of epithelium derived from the wall of the bladder).

The other organs were all anæmic, but to the naked eye otherwise normal.

The points in this case which I especially desire to emphasise in connection with the subject to which I am at present referring, viz., the very varied forms which lymphatic leukæmia presents, are:—

(1) The extreme rapidity of its course.

(2) The very slight lesions which were present in the lymphatic glands.

In both of these respects it presents a marked contrast to the next case (Case IV.), and yet in both cases the condition of the blood was, practically speaking, the same.

CASE IV.—*Chronic lymphatic leukæmia; great enlargement of the lymphatic glands, considerable enlargement of the spleen, marked affection of the bone-marrow; infiltration of the liver and kidney with lymphocytes.*

W. M., aged 50, a farrier, married, was admitted to the Edinburgh Royal Infirmary on 2nd November 1899, and died on 13th November 1899.

He complained of weakness, especially about the back, loss of flesh, shortness of breath on exertion, occasional attacks of faintness, and swellings (glandular enlargements) in the neck, axillæ and groins.

The present illness had commenced eighteen months previously without obvious cause. The patient had previously been a very healthy, strong, active, temperate man.

In June 1898 he noticed some small lumps (enlarged glands) in each armpit. *In March* 1899 he had a severe attack of diarrhœa and was confined to bed for two months. *After this* glandular swellings developed on each side of the neck and in the groins. These glandular swellings in the axillæ, neck and groin have gradually increased in size; they have never been painful and none of them have suppurated. Since the illness commenced the patient has got paler and thinner, having lost more than three stones in weight. During the course of the illness he had had several attacks of fever, each of which has lasted for a few days.

Family history excellent; none of his near relations had suffered from scrofula or phthisis.

State on admission.—The patient was very feeble, thin, pale and pasty-looking, the mucous membranes (lips and conjunctivæ) being markedly anæmia; he only weighed 6 st. 13 lb. He could not walk without the support of two sticks. The temperature was 99° and the pulse 100. The limbs were much emaciated and the muscles soft and flabby. There was no œdema of the feet. There had been no hæmorrhages. The optic discs were normal.

Large glandular swellings were present on each side of the neck and in both axillæ; there were also some smaller glandular swellings in each groin, and one enlarged gland in the left popliteal space; there

were no enlarged glands in the elbows. A large wen was present on the back of the head (sub-occipital region). Over the front of the thorax and over the glandular swellings in the axillæ the veins were markedly prominent and dilated.

The neck was very much swollen from the clavicles below to the ears above. The swelling was due to masses of enlarged glands which were situated on each side of the sternomastoid muscle and under the lower jaw. The individual glands varied in size from a marble to a hen's egg; they were soft and elastic but not fluctuating; quite painless; and not adherent to one another or to the over-lying skin.

In the axillæ the glandular swellings were very large, some of the individual glands being the size of a Tangerine orange. Here, as in the neck, the enlarged glands felt soft but not fluctuating, painless and non-adherent to the skin.

In the groins the glandular masses were much smaller, but of the same character and consistency as in the neck and axillæ.

In the abdomen two swellings about the size of a cherry were present in the wall on the left side; large indurated masses, apparently enlarged glands, could be felt in each iliac fossa, and some lumps, presumably enlarged glands, in the cavity of the abdomen.

The bronchial glands and (?) mediastinal also appeared to be enlarged. There was distinct dulness on percussion around the root of each lung and over the upper and middle parts of the sternum and the adjacent parts of the chest; the veins on the front of the thorax, the axillæ, and head were engorged.

The patient was very short of breath on exertion; he complained of cough when lying on the back, relieved when he turned on to the side. The voice was somewhat husky and harsh. The pupils and pulses were equal. There was no difficulty in swallowing. Shooting pains were occasionally felt in the back.

The spleen was considerably enlarged; it extended slightly below the costal margin in the axillary line.

The liver was also enlarged; in the line of the nipple, the lower border was two inches below the costal margin.

The sternum, in its middle part, opposite the junction of the fourth costal cartilage, was markedly tender to the touch, and the bone at this point seemed to be swollen.

The gums were natural; *the tonsils* were not enlarged.

The blood.—The *red corpuscles* numbered 3,000,000 per cubic millimetre; the *hæmoglobin* equalled 48 per cent.; the colour index is consequently (after correction for the low reading of Gowers' instrument) $\frac{\text{H. } 64}{\text{R. C. } 64} = \cdot 8$; the *white corpuscles* numbered 31,900 per cubic millimetre, the increase being almost entirely due to an excess of lymphocytes (both large and small).

Dr Gulland kindly examined the blood and reported as follows:—

Rouleaux well formed; fibrin network well formed; blood plates about normal.

The red corpuscles differed considerably in size; but there were very few poikilocytes; one doubtful normoblast was seen.

Differential count of 500 leucocytes:—

Polymorphonuclear		14 per cent.
Eosinophiles		1½ "
Lymphocytes		
(*a*) large	49	"
(*b*) small	35½	"
		84½ "
		100 "

Micro-organisms.—The blood was carefully examined for micro-organisms, but none were found.

The condition of the other organs.—*Heart* normal; *lungs* some bronchitic râles and crepitations; *stomach* and *intestines* apparently normal; *liver* considerably enlarged; *urine* normal in amount, sp. gr. 1022, it contained a small quantity of albumen but no blood.

The diagnosis was lymphatic leukæmia, with unusually large glandular swellings.

Subsequent progress of the case.—The white corpuscles rapidly increased in number; on November 9th they numbered 109,600 per cubic millimetre. *On November 8th*, bronchitis, which gradually developed into broncho-pneumonia, appeared; and on November 13th, 1899, the patient died.

The condition of the temperature, pulse and respirations during the time that the patient was in hospital was as follows:—

	Temperature.		Pulse.		Respirations.	
	M.	E.	M.	E.	M.	E.
November 2		98·8		100		24
" 3	98	97	94	92	24	20
" 4	98·4	98·4	88	88	20	20
" 5	97	97	88	100	22	20
" 6	97	97	100	104	20	18
" 7	97·8	100	88	88	20	24
" 8	101	102·2	118	92	28	20
" 9	101·8	101·6		120		22
" 10	10·6	102·8	122	140	32	30
" 11	102	100·8	126	144	30	36
" 12	100·6	100·4	132	128	42	40

The blood counts at different dates (Dr Gulland's counts) were as follows:—

November 4, 1899.	*Reds* 3,000;000	*Hb.* 48	*Whites* 31,900
" 6, "	" "	" "	" 59,300
" 7, "	" "	" "	" 70,500
" 9, "	" "	" "	" 109,600
" 10, "	" 3,200,000	" 60	" 94,600
" 12, "	" "	" "	" 88,600

DIFFERENTIAL COUNTS

	Nov. 4th.	Nov. 6th.	Nov. 7th.	Nov. 9th.
Polymorphs .	14	6	3	11
Eosinophiles .	$1\frac{1}{2}$	1	$\frac{1}{3}$	$\frac{1}{2}$
Lymphocytes .	$84\frac{1}{2}$	93	$96\frac{2}{3}$	$88\frac{1}{2}$
	100	100	100	100

Treatment.—This consisted in the administration of arsenic, quinine, oxygen inhalations, stimulants, etc.

Post-mortem examination November 14th, 1899.

The body was markedly emaciated; colour pale; rigor slight; lividity slight.

Lymphatic glands.—The lymphatic glands on both sides of the neck, in both axillæ and in the groins were enlarged, many of them enormously so; those in the right axilla measured, as a whole, 6 × 2 in.; the largest individual gland mass in the left axilla measured 3 × 3 in.

Enormous masses of enlarged glands were present in the iliac fossæ, in the mesentery, around the abdominal aorta, behind the cardiac end of the stomach and the adjacent part of the œsophagus. The mediastinal and bronchial glands were also considerably though less markedly enlarged.

The individual glands were not adherent to one another; they were soft and pulpy in consistency; some of them deeply congested, in places of a deep purple in colour, others of a yellowish grey colour mottled with purple, others yellowish white. The purple coloured and mottled glands looked, to the naked eye, like small-celled sarcomata.

There were no distinct lymphoid deposits or nodules in any of the organs except perhaps in the kidneys.

The *spleen* weighed 12 oz. and measured $8\frac{3}{4} \times 3\frac{3}{4} \times 1\frac{3}{4}$ in.; the glands in the hilum were enlarged. On section the spleen was firm and dry looking as if it had been much larger and had contracted; the colour was rose pink; the fibrous tissue increased; the Malpighian bodies set close together; here and there were patches of congestion.

The *tonsils* appeared to be normal; the *thyroid* and *pituitary body* were normal. The *suprarenals* were normal.

The *heart* weighed $11\frac{1}{2}$ oz.; the epicardium over the front and back of the right side was thickened; the cavities contained mixed thrombi which extended into the aorta and pulmonary artery; the valves were normal; the coronary arteries were thickened; there were some fatty patches in the wall of the left ventricle.

The *larynx* and *trachea* were normal.

The *bronchial mucous membrane* was congested and inflamed. The *bronchial glands* were enlarged and soft.

Lungs.—The *right* lung weighed 2 lb. 14 oz.; it was slightly emphysematous along its borders; the upper lobe was in a condition

of solid œdema almost approaching red hepatisation; the rest of the lung was œdematous.

The *left* lung weighed 2 lb. 7 oz.; in it there were several consolidated patches of lobular (almost lobar) pneumonia, which on section were red and granular.

The *liver* was much enlarged; on section it showed a diffuse fatty change with some atrophy. The gall-bladder was small and contained some orange-coloured bile.

The *sternum* was thickened at the level of the area which was tender during life, its bone-marrow being increased to three or four times the normal amount, and of a red colour. The bone-marrow of the femur was also increased in amount and of a deep purple-red colour.

Kidneys.—The left kidney weighed 6 oz. The capsule was not thickened; the organ was pale and looked fatty; patches of lymphatic infiltration passed down between the tubules of the cortex.

The right kidney weighed 5½ oz.; it was smaller, more cirrhotic and more conjested than the right.

The *stomach* and *intestines* were normal.

The *brain* was normal.

The chief naked-eye changes found on post-mortem examination were:—

(1) The enormous enlargement of the lymphatic glands throughout the body.

(2) The enlargement of the spleen.

(3) The marked alteration of the bone-marrow.

(4) The absence of lymphoid deposits and infiltrations in the organs, with the exception of the kidneys.

(5) The recent pneumonic changes in the lungs, which were apparently the immediate cause of death.

Dr Gulland has kindly given me the following report on the microscopic condition of the different bones and organs:—

Microscopic Condition of the Organs (Dr Gulland)

Bone-marrow.—A fair number of various capillaries, but the great mass of the sections taken up by lymphocytes crowded together without arrangement, mostly of the small variety. Fat almost absent, giant cells few and all degenerated, very few myelocytes, eosinophiles or nucleated red corpuscles.

Lymphatic glands.—Some very vascular, others with few vessels. In none can the normal gland structure be made out, they consist simply of thin strands of connective tissue irregularly arranged, with masses of lymphocytes between.

Spleen.—Closely resembles the more vascular lymphatic glands in appearance; very little pigment to be seen.

Liver.—Numerous lymphoid deposits, the great majority of which are in and about the portal spaces.

Kidney.—Deposits large and small, mainly in the cortex and round the vessels.

Suprarenal, thyroid, show a few deposits.

Tonsil like vascular lymphatic gland.

Intestine.—Mucous membrane atrophied, or Peyer's patch, does not show normal structure, but consists of a mass of lymphocytes.

Lung.—The pneumonia, of which he died, shows a perfectly ordinary structure; the leucocytes in the alveoli are all, or practically all, polymorphonuclears, as is usual.

Dr Gulland's Remarks on the Case

This was evidently an old-standing lymphatic leukæmia, in which the glands, spleen and marrow were almost equally affected. The blood-picture was affected by the pneumonia of which the patient died, and which caused the increase in the polymorphonuclears. In such a case, free from inter-current affection, one would have expected the lymphocytes to have been about 98 per cent.

3. NOTE ON SECURING THE LINGUAL ARTERY IN EXCISING THE TONGUE THROUGH THE MOUTH

By Charles W. Cathcart, F.R.C.S., Surgeon, Royal Infirmary, Edinburgh

There can be little doubt that securing the lingual artery is the main difficulty in excision of the tongue, and that the risks both at, and after the operation, are greatly reduced when bleeding into the mouth during its performance can be kept at a minimum. It would not be difficult to show that most, if not all, of the past as well as the present methods of excising the tongue have turned very much upon this difficulty. While many surgeons now adopt a preliminary ligature of the lingual artery through the neck, there are still a large number who for various reasons do not think this procedure generally advisable. On the other hand, for those whose experience is limited, the operation through the mouth without preliminary ligature is a matter of considerable anxiety. By a slight modification, however, of the existing method of excising the tongue through the mouth with scissors, I find that the artery can be secured at an early stage of the operation at the same level as, and with no more difficulty than in the operation of preliminary ligature through the sub-maxillary triangle.

The first stage is that usually adopted to permit of the tongue being drawn well out of the mouth, *i.e.* the jaws are

opened widely, the tongue drawn forward with a stout silk suture in each half, the mucous membrane divided along the middle line of the dorsum, behind the growth, and between the tongue and the jaws; the tongue split; and the fibres of the genio-hyoglossus snipped through close to the symphysis.

The second stage is that of ligature of the lingual artery thus: with a few vertical strokes of a director or other blunt instrument, the anterior edge of the hyoglossus muscle is defined at the junction of the posterior and middle thirds of the tongue. The director is then insinuated beneath it, the tissues being separated with the point before it is pushed on. The muscle is next carefully cut through on the director for about two-thirds of its extent, and the fibres retracting leave the artery at the bottom of the wound covered only by a little connective tissue. With the point of a director the vessel can be easily defined as a bluish white cord and traced downwards and backwards. An aneurism needle should be passed under it well back, and the vessel tied before it is cut. After the artery has been ligatured and divided, a few snips should be made with the scissors radiating out from it into the substance of the tongue. This lessens the chance of one's cutting the artery again when finishing the operation.

The third stage consists in completing the operation with scissors cutting wide of disease.

This method has the following advantages over the usual operation through the mouth where the artery is left to the last, *i.e.* ease in securing the lingual artery, diminished bleeding from small vessels, and in consequence, greater certainty in cutting wide of the disease. The neck is moreover left intact for the subsequent removal of all the glands, as recently recommended by Mr Butlin.

In cases where the disease has become very extensive, preliminary ligature of the lingual artery behind the hyoid bone would be preferable, but the majority of cases that present themselves nowadays for operation would probably be quite suitable for this method of ligature through the mouth.

Meeting VI.—February 19th, 1902

PROFESSOR T. R. FRASER, M.D., LL.D., *President, in the Chair*

This was a special meeting of the Edinburgh Medico-Chirurgical Society, held in the Royal College of Physicians, Queen Street, Edinburgh, for the purpose of discussing the establishment of wards for the treatment of "incipient and transitory mental disorders" in connection with the Royal Infirmary.

There was a large attendance. Apologies for absence were received from the Lord Provost, Sir Charles Pearson, Mr John Cowan, Dr John Fraser, Dr Mar and Dr Farquhar.

The CHAIRMAN, in his opening remarks, explained that they had met for the purpose of discussing the treatment and teaching of incipient and transitory mental disorders. The subject had been already brought into notice at a meeting held in that hall on the 21st of January, when the general objects of the scheme were laid before certain representative members of the medical profession and of the Royal Infirmary by Dr John Macpherson, Commissioner in Lunacy, and Sir John Sibbald, who formerly held that office. The present meeting, therefore, might be said to represent the second stage in a movement which had been conceived for the purpose of conferring benefit upon a section of the citizens who were, he believed, to a large extent overlooked by the benevolent schemes which were carried on in Edinburgh and also to confer a benefit upon the public generally by increasing the educational advantages of its School, adding another element to those already existing which had rendered the position of the great Medical School of Edinburgh such a satisfactory one. The movement seemed to have arrived at the stage when it was necessary and important to define accurately its objects, and to endeavour to obviate those difficulties which every pioneer movement must expect to encounter. The Edinburgh Medico-Chirurgical Society very completely represented the medical views of the city and of a very large part of Scotland, and it was therefore important that the views of its members should be obtained. They were confronted by two great problems. They had in the first place to endeavour to define the kinds of mental disorder that

were likely to be beneficially and appropriately treated in a general hospital as distinguished from a lunatic asylum, and in the second place to try to come to some conclusion as to the best place in which provision for such treatment could be made. They wanted to know exactly what accommodation was required, how many cases were proposed to be treated, how far that provision could be obtained in the Royal Infirmary, to what extent the pecuniary resources of that Institution would be drawn upon in providing the necessary accommodation, and in what respects treatment in the Royal Infirmary would confer benefit upon the patients, and upon the general public, for example by improving the educational facilities and thereby increasing the usefulness of the medical practitioners of this country. With these few preparatory remarks, he now called upon Sir John Sibbald to read his paper on the subject.

Sir JOHN SIBBALD, M.D., F.R.C.P.Ed., I have to thank the Council of the Society for their kindness in appointing a day for the discussion of the question which is the subject of the following paper. The paper has been written at the suggestion of my friends Dr Clouston and Dr John Macpherson, but it is right to say, as they have left me a free hand in dealing with the subject, that they are not to be held responsible for the opinions it contains.

Our chief object is to elicit the views of the meeting in regard to what we deem an important defect in the present arrangements for the treatment of mental disease, and for giving clinical instruction in regard to it, and I am to indicate that in our opinion this defect might be best remedied by the establishment of wards in the Royal Infirmary for the treatment of incipient and transitory mental disorders. I therefore propose to show that, from the point of view of public charity, the establishment of such wards is desirable, and I hope also to make it clear, both that the present opportunities for clinical instruction in insanity are singularly inadequate, and that the wards we propose would furnish the means of making such instruction efficient and complete.

I should like, however, to make a few preliminary observations to show the position of the question to which this proposal refers. The raising of the question at present is entirely due to my friend Dr John Macpherson, one of His Majesty's Commissioners in Lunacy, who contributed a valuable article on

the subject to the *Scotsman* of 4th July last; and if, as I hope, the present discussion takes effect in the establishment of the wards we desire, it is to him that our gratitude will be due. It is not, however, a new question. In the original plan of the Royal Infirmary a large portion of the under floor was appropriated to patients suffering from mental derangement, so that the question of providing for such cases within the institution dates back to, at the latest, the year 1738. But the question was not discussed in its present form till the middle of the nineteenth century, before which time neither the importance of hospital treatment for the early stages of insanity, nor the necessity for any clinical teaching in insanity can be said to have been recognised. Even so late as the year 1870, as I showed in an article in the *Journal of Mental Science* (January 1871), neither in this country nor on the Continent was provision for the clinical teaching of insanity in the medical schools anything but exceptional. The first who effectually awakened an interest in the subject was Griesinger, who, for some years previous to his appointment in 1865 as Professor of Nervous and Mental Diseases in the University of Berlin, had insisted on the importance of providing efficiently for such teaching in every medical school. My own active interest in the subject began in 1866, when I translated the opening lecture of Griesinger's first course at Berlin (*Journal of Mental Science*, January 1867). In 1867, I attended several of Griesinger's lectures in Berlin, and in that and subsequent years advocated, when opportunity offered, the establishment in this country of wards somewhat similar to those at Berlin. But I felt, in common with many others, that the most important requirement in those days was to obtain the recognition of instruction in insanity in any shape as a compulsory part of a medical curriculum, a recognition only recently obtained in Scotland, and one for which, I understand, we are largely indebted to the advocacy of Sir Arthur Mitchell, when a member of the late Scottish Universities Commission. The importance of teaching insanity, and of illustrating the teaching clinically, gradually, indeed, became more and more felt, until now there is teaching, both systematic and clinical, in connection with every medical school. The clinical teaching is, however, always given in asylums, and that this is an imperfect arrangement was early recognised. The late Professor Laycock

recognised this so clearly that he suggested in 1869 that the managers of the Royal Infirmary should set apart wards for the treatment of mental disease, which would be useful for the instruction of the great body of medical students. Sir Arthur Mitchell also advocated the establishment of such wards in his Morison Lectures in 1871, and so far succeeded in the advocacy that plans were prepared for such wards among the original plans for the buildings of the present Royal Infirmary. Sir John Batty Tuke, though he afterwards supported a proposal that a special hospital for the treatment of mental disease, and for its teaching, should be established in London, said in an article in the *Nineteenth Century* for April 1889, that "the ideal arrangement for teaching is a department for the treatment of insanity in connection with general hospitals." And, as having an important bearing on our proposals, I should not omit to mention that Dr Carswell has induced the Glasgow Parish Council to establish wards in connection with their Poorhouse Hospital for the treatment of the early stages of mental disorder which have been in operation for more than twelve years. Though these wards have not, so far as I am aware, been made to serve the purpose of clinical instruction, Dr Carswell has shown the usefulness of such wards in providing for patients whose malady has not reached the stage which makes relegation to an asylum necessary.

Other illustrations might be given of the way in which the question now raised has occupied the minds of those interested in the treatment of the insane and in the efficiency of medical teaching; but sufficient has been said to show that the matter has been long under consideration.

Little need be said to show that the wards we propose would be useful from the charitable point of view, as patients in the early stages of mental disorder are at present almost entirely neglected. If any of these unfortunate sufferers require hospital treatment, the only direction in which we can look is either to general hospitals or to lunatic asylums; but the help we desire cannot be obtained there, for cases of mental disorder are as a rule excluded from general hospitals, and the cases we have in view have not arrived at the stage which makes relegation to an asylum either necessary or justifiable. It is certain, therefore, that a considerable number

of patients are thus allowed to fall into incurable insanity who might have been, and indeed ought to have been saved from that fate.

A few words may be said as to the way in which these cases of commencing mental disease have come to be unprovided with hospital treatment. I need scarcely say that it is not in any sense the result of premeditated neglect. It has arisen, indeed, in an indirect way, from the exceptional care that the Legislature has taken to provide efficient hospital treatment for the insane as a whole, they being the most numerous of the few special classes of patients for whom hospital accommodation is provided compulsorily by the ratepayer. This accommodation, as everyone knows, is given in the institutions called lunatic asylums; but the Legislature has judged it necessary so to hedge round with statutory precautions the admission of patients to these institutions, and there are such impediments in the way of their admission due to social considerations, that it is not until a mental disorder has taken indubitable hold of a patient, and not even then in many cases, that the asylum can be resorted to. The statutory precautions, at least as regards all patients except those called "voluntary patients," who are necessarily a very small class, prevent the admission to an asylum in Scotland of every person for whom medical certificates, according to a prescribed form, and a Sheriff's order, cannot be obtained, and similar precautions exist in England and Ireland.

The impediment arising from social considerations is perhaps the most important of all. It is always with great reluctance and only as a last resort that a patient is placed in an asylum; and it must be admitted that this reluctance is reasonable. So far as the reluctance is justifiable, and so far as it has much practical effect, it rests on the fact that a person who has once been an inmate of an asylum is regarded, though often quite erroneously, as unreliable for sound judgment and prudent conduct, and is henceforth seriously handicapped in the battle of life. For these two reasons then, the legal and the social, there is a large number of the persons suffering from mental disorder who are prevented from being treated in asylums at the stage of the disorder when treatment is not only most needed but also most likely to be effective in promoting recovery. As I have already indicated, this exclusion

from asylums means, as regards these patients, their exclusion from hospital treatment of any kind. For although a case occasionally finds its way into a general hospital, they are as a class without any available opportunity of hospital treatment. In the case of Edinburgh, it seems clear that such treatment can only be obtained by the establishment of special wards in the Royal Infirmary. It is evident at once that nothing of the character of a lunatic asylum would do. Any establishment into which only insane persons are received will be shunned, as asylums are at present, and for the same reason. In the treatment of the class of patients under consideration, the special arrangements which distinguish asylums would not be required, and the wards therefore need not differ appreciably from the ordinary wards of a general hospital. Every arrangement, indeed, which would suggest the idea of an asylum should as much as possible be avoided as tending to prevent patients and their friends from availing themselves of the benefits which the wards would offer. Nothing, in fact, should be done to emphasise, but rather everything should be done to obliterate, the line of demarcation which has too long been drawn between patients suffering from what are called bodily diseases and patients suffering from what are called mental diseases, or, to state it more correctly, between those whose bodily illness has affected their minds and those whose bodily illness has left the mind in its normal condition. After all, the distinction that has been made is based on imagination more than on fact; for there are few diseases in which both the intellectual and the emotional operations are not more or less modified or impaired: and the diseases which we call mental are only those in which this modification or impairment is so great and so persistent as to interfere seriously with the fitness of a patient for responsible action. It might reasonably be expected also, if it were understood by the public that special attention was given in the infirmary to the class of cases just mentioned, there might be established in connection with the proposed wards a useful "out-patient" department in which patients suffering from mental failure or exhaustion or any of the mental troubles which result from unsoundness of health, might receive trustworthy and helpful advice and assistance. Such a department would certainly be more resorted to by patients if it were connected with the Royal Infirmary than if it were connected

with an institution devoted solely to the treatment of mental disease.

It is perhaps necessary to say a few words more upon the question whether wards which do not differ appreciably from the ordinary wards of a general hospital would be suitable for the treatment of the class of patients we have in view. It is impossible to discuss this question fully on the present occasion, but I hope in a few words to indicate broadly the grounds on which I feel satisfied that they would be quite suitable.

It must of course be borne in mind that it is not proposed that patients should be kept in the wards for long periods. Neither is it proposed that the wards should be places for the compulsory detention of patients except in the same sense that the wards of general hospitals sometimes are for patients suffering from ordinary diseases. The limitation of the period of residence is important, for this reason among others, that it helps to define the character of the cases to be treated. For my own part, I should be satisfied with a limit of six weeks. Before the end of that time, if death or recovery had not taken place, it would in most cases have become evident that removal to an asylum was inevitable. And the restriction as to compulsory detention would exclude such patients as, if they are to be interfered with at all, can only be dealt with under the statutory provisions which regulate the admission of patients to asylums.

In any discussion of the arrangements of the wards it is also necessary to keep in view the trend of medical opinion as to the treatment of mental disorder in its early stages; and there can be no doubt that this opinion has been steadily moving more and more towards the adoption of methods resembling those resorted to in the treatment of bodily disease. The main indications of treatment, especially for the incipient and transient phases of mental disorder, whether characterised by melancholic depression, maniacal excitement, mental confusion, or stupor, are to obtain repose, to induce cessation of effort both mental and bodily, and to restore the nutritive processes to healthy action. In the great majority of cases, these results are best attained, in addition to medical treatment on ordinary therapeutic principles, by rest in bed, by continuous nursing, and in certain cases by a discriminative application of hydrotherapy. In recent years, the conviction has been

growing that treatment, on the lines of that associated with the name of Weir Mitchell, which has been found so efficient in dealing with other neurasthenic conditions, is equally applicable to the early stages of mental disorder. It is not of course to be regarded as a panacea; but there is good reason to regard it as an essential element in the treatment which is most likely to benefit the great majority of such cases. Active exercise and occupation are no doubt invaluable in the treatment of many cases of mental disorder, but their chief use is either in cases which have not reached the stage when hospital treatment is desirable, or in cases which have passed that stage and become suitable for treatment in an asylum. Recent experience has shown also that many of the benefits formerly supposed to be obtainable only by voluntary exercise can be better obtained by massage and similar expedients included in the Weir Mitchell method.

This method, generally known among alienists as "bed treatment," has for many years, chiefly under the influence of Guislain, of Ghent, and of Ludwig Meyer, of Göttingen, been growing steadily in favour, and its efficiency is now widely recognised among asylum physicians in this country.

The practical conclusion which I think we are justified in drawing from these considerations is, that such asylum adjuncts as workships, exercise gardens, cricket fields, and other arrangements not usually found in general hospitals, would be quite unnecessary in connection with the proposed wards.

But we cannot omit from consideration, when discussing the arrangements of the wards, the improved system of nursing, the so-called *continuous* nursing, which has developed *pari passu* with the bed treatment. One of the results of this development has been to modify and, in the minds of many, to revolutionise our ideas of the structural requirements for the treatment of active mental disease. One of the results of the adoption of the system is that the seclusion rooms and single rooms of all kinds, which were formerly regarded as indispensable for the treatment of a large number of asylum inmates, especially the excited and restless, are found to be required only in a few exceptional cases. With very few exceptions it is now found that cases of acute insanity, even the excited and noisy patients, can be more efficiently treated in associated dormitories than in single rooms.

Another recent development has brought wards for mental diseases more into line with ordinary hospital wards than they formerly were. This is the introduction of nursing by women into the male wards of asylums. In regard to this I shall content myself with a statement of the matter as it exists at present in the Stirling District Asylum. There, the chief officer on the male side, under the medical staff, is a lady superintendent; and out of a total of 350 male patients, 115, or nearly a third, are, during the daytime, entirely under the care of female nurses, and this third includes the great majority of the male patients suffering from acute forms of mental disorder. Sixty-seven of the male patients are at present under the care of female nurses both night and day.

I have already indicated that hydrotherapy is useful in some early cases. To provide for this, however, it would only be necessary that a bathroom should be attached to the wards. In regard to the importance of this treatment, I may refer you to a valuable article on the subject by Professor Kraepelin of Heidelberg in the *Centralblatt für Nervenheilkunde u. Psychiatrie* for December last.

In estimating the value of the kind of treatment I have so imperfectly sketched, I attach great importance to the circumstance that it tends in every way to foster the feeling among the patients that they are from first to last regarded as suffering from illness which requires medical treatment, and to make them recognise that everything that is done has for its object the promotion of their welfare.

It will require very few words to indicate the nature of the defect which exists in the present arrangements for clinical teaching. You may well believe that it does not rest upon anything for which the eminent lecturers are responsible who conduct the teaching for the University or for the Royal Colleges School. The defect is twofold. It is partly that the seats of the teaching at Morningside and at Larbert are too distant from the locality where the rest of the medical teaching is conducted; and the students can therefore only avail themselves of it to a very limited extent. To make the teaching really efficient, it must be given in the immediate neighbourhood of the school; and this has been so fully recognised in Germany that since the year 1866 special buildings have been

erected in the immediate neighbourhood of sixteen of the German universities to fulfil this requirement. At the other four universities the defect did not exist as there were wards for mental diseases connected with the general hospital, so that every university has now its psychiatrical clinique close to the medical school.

The requirement that the clinical teaching of mental disease should be provided in the immediate neighbourhood of the medical school is thus fully met by the German universities. I do not wish it to be understood, however, that I recommend the example of Germany as one to be followed in every detail. It would probably be found that the difference in the requirements of the lunacy laws in Great Britain from similar enactments in Germany renders an exact imitation impossible; but independently of that consideration I think from what I have seen of the German arrangements that they have in several cases too much of the asylum character. They are in these instances not sufficiently identified with the general hospital and are really small asylums, although intended only for the treatment of recent insanity. They are looked upon by the general public as asylums, and there is the same fear of being stigmatised by residence there that there is in the case of ordinary asylums. They fail, therefore, to provide hospital treatment for the class of cases which we desire to benefit. The existing example within my knowledge which comes nearest to the ideal in my mind is shown in the Communal Hospital at Copenhagen, which, however, I am only acquainted with through the description given by Dr Urquhart, of Perth, in a paper read at a meeting of the Scottish Division of the Medico-Psychological Association in 1896. In this general hospital containing nine hundred beds, which is in the immediate neighbourhood of the university, there are two pavilions under one chief physician, each containing about sixty beds, one for mental diseases and the other for other nervous diseases, and both are available for clinical teaching. At the time of Dr Urquhart's visit the nursing of the male patients had for eight years been done by female nurses, one male attendant being attached to each of the two male wards. The male attendants are subordinate to the female nurses, and are not engaged in what is strictly speaking nurse's work. During the eight years only one patient had been found impossible for

female nursing. The average length of residence of the patients was about three months.

The other aspect of the defect in the present clinical teaching is even more important than mere distance. The great majority of medical students are destined to be general practitioners, and all clinical teaching should therefore supply in the first place the knowledge which will be useful to the general practitioner. But the only clinical teaching of mental disease that exists at present is given in lunatic asylums, and consequently the only patients whom the students see are those whom the general practitioner is not called upon to treat.

I do not wish it to be understood that, while advocating the establishment of the proposed wards, I am of opinion that no useful clinical teaching is to be obtained in asylums. On the contrary, I think that cases of recent insanity may be seen in asylums from which lessons of great value to the ordinary medical student can be drawn, and that there are many cases only to be met with in asylums which the medical student should see if he is to have clinical teaching in its most complete form. I should therefore be glad, where an asylum is within convenient reach, that the opportunities of instruction which it affords should not be neglected. The point I wish to emphasise is, that under present arrangements the ordinary medical student receives no clinical teaching as to the treatment of the incipient and the transitory phases of mental disease. It is in the treatment of these phases of mental disease that he will in after life find himself in presence of one of his most serious responsibilities, and it is only by the establishment of such wards as we propose that he can be duly equipped for the discharge of these responsibilities. We desire to press as strongly as we can upon the minds of the members the urgent need there is to provide them. We think that in this way provision would be made for the treatment of a class of patients now exceptionally neglected, and also for the education of the practitioners of medicine for a most important part of their work, and that a step would be taken which would redound to the credit of Edinburgh. (Applause.)

The MASTER OF POLWARTH then addressed the meeting. He did so, he said, with some diffidence, and in virtue only of his official position as Chairman of the General Board of Lunacy. He felt that it was not only a duty, but a great

personal pleasure to take even a small part in such a meeting as that, the objects of which were at once so very interesting and important. He did not think that Scotland had been backward in such matters in the past, and he earnestly hoped that such steps would now be taken as would tend to keep her well in the forefront, for it was somewhat disquieting to hear of the great advances made by Germany while perhaps they in Scotland had not done so much as they might. This movement seemed to be a further step in the direction of recognising that those who were mentally afflicted required hospital treatment just as much as those who suffered from other forms of disease. Our asylums were recognising that fact in an ever-increasing degree. If they could have in the Royal Infirmary wards such as those now proposed, they would be going a long way towards breaking down the popular idea in regard to mental disease. He might also incidentally point out the advantage that would accrue to the ratepayers from the diminution in the number of lunatics requiring asylum accommodation. The benefits resulting to those entering the medical profession had already been touched upon. The additional opportunities thus provided for the study of mental disorders in the early or incipient stages would be a great boon, and would tend to minimise the danger of mistakes being made in the granting of certificates of insanity. He was glad to be able to assure the meeting, as the representative of the General Board of Lunacy, of the great interest and approval felt by members of the Board in the scheme now brought forward.

Sir JOHN BATTY TUKE said he wished to express the extreme satisfaction he felt when he heard that this movement had taken shape. For the last twenty years he had, on every available occasion, been trying to lay before the public the advantages which would accrue from the treatment of early and incipient cases of insanity in the general hospitals of the country. He confessed to a slight feeling of disappointment, both at that meeting and at the former one, when no notice was taken of those statements of his. He made these personal observations only because it gave him an opportunity of alluding to an important matter in the history of this business which had been but casually referred to that day. Sir Arthur Mitchell, when the new Infirmary buildings were in course of erection, made a strong and earnest endeavour to

get wards such as were now proposed, but even his great influence failed. Papers were written on the subject by himself (Sir John Batty Tuke) and by Sir Brudenell Carter, the great ophthalmic surgeon of London, in similar terms. The latter was permitted by the London County Council to have a committee appointed to consider the subject, and the results of its investigations were embodied in a report which he (Sir John) now laid upon the table. The report was entirely favourable to the external treatment of insanity, but it lapsed in consequence of the strong opposition brought to bear upon it by asylum physicians in London and by the Medico-Psychological Association. He thought that was a matter of history well worth recording. He advocated such a scheme on two grounds, namely, that it would reduce the number of lunatics and that it would exercise a great and widespread educational influence throughout the country. Certainly the ratepayer was groaning under the increase of the rates, and what was being done to remedy this state of things was being done at the wrong end. The rates were spent in the interests of the chronic lunatic, and nothing was done for the patients in that early stage which required most careful treatment. Not the slightest attempt was being made to avert the manufacture of the chronic lunatic. Asylum statistics afforded evidence as to the large number of cases which recovered within one month and of the diminuendo movement which went on as the months continued. If they excluded general paralytics and epileptics from their statistics and considered only all other cases of insanity, these being treated in the earlier stages, they would get 70 per cent. of recoveries. The increase of chronic lunatics was not in the upper classes, which could afford early and efficient treatment, but in the lower and working classes, which could not. Our infirmaries took no cognisance of any form of insanity except that which was produced by alcoholic excess. He would strongly urge upon the public once more that it was their duty to take steps to check the increase of lunacy. He fully agreed with what Sir John Sibbald had said as to the accommodation and treatment to be provided. The educational influence of such a ward or wards would be important and widespread. It would tend to break down the popular misconception regarding insanity, and would in time affect legislation as the public mind became accustomed to it. Above all,

it would rapidly do away with that stigma which attached to insanity and which had no more right to attach to insanity than to any other form of disease. He believed that the opportunities afforded to the general practitioner by such an institution, of studying the early stage with all its delicate symptoms would be of the utmost importance and benefit to the world at large. He thought it would be the duty of that meeting to impress as strongly as possible upon the managers of the Royal Infirmary the propriety of entertaining and carrying out a scheme of this kind. They were told and told with absolute certainty that such a scheme would benefit the individual and the public, and that it would influence public opinion in the right direction, and if our Infirmary managers took it up, to them would belong the credit of being the first hospital authorities to take a wide, a broad and beneficent view of the nature and treatment of insanity.

Dr AFFLECK said that he should like, as one who had recently held the position of physician to the Royal Infirmary, to say a few words in support of the proposition. He had frequently during the latter period of his service in the Royal Infirmary had persons sent into the out-patient department who showed evidence of suffering from mental disorder, not all of whom required asylum treatment. He had felt the want of a place where such cases of mental disturbance, caused it might be by over-work, or hardship, or ill-health, could be treated for a short time, since they required only kindly treatment and rest, for the cure of their temporary mental sickness. He had ventured, not without trepidation, to admit some of these people into his wards in the Infirmary, where he had been able, by the co-operation of his nurses, to give them the treatment necessary, and he was glad to say that in almost every case the results had been entirely satisfactory, the patients making a complete recovery and being able to return to work. His experience in that way had convinced him very strongly of the need for a ward such as they were advocating in the Infirmary if at all possible. From what he had seen both at home and abroad, he was sure that the insane were nowhere treated with more scientific enlightenment, greater humanity, or with greater success than in the asylums of this country, but an asylum was always an asylum, and what they wanted was to

keep patients out of it as long as possible in order that, if curable, they might escape the stigma attaching to insanity in the public mind. There were other points of view, he knew, besides those of the medical practitioner and the clinical teacher, and he was quite aware that, from the Infirmary managers' point of view, there were many difficulties in the way, but he did not believe they were insuperable. Was such an undertaking within the scope of the Royal Infirmary's work? That was a very important and fundamental question in considering this matter. He thought it did fall within the scope of the Infirmary's work, because a great many of those cases were transient and temporary, being due merely to ill-health, and if it were the prerogative or the function of the Infirmary to care for and cure the sick, surely it was no less its function to cure those who were sick in mind as well as in body. But, looking at the matter from a technical point of view, they had to consider whether it was in the Infirmary's power with the means it had at its disposal to undertake such a thing as this, because if they had a department of this kind established, it must be in close association with the Infirmary's buildings. They could not remove it away out of town, because that would do away with the feeling that this was a part of the Infirmary's work. He knew that there was no room in the present premises of the Infirmary for the establishment of wards such as were suggested, and the only way he could think of was for the Infirmary to acquire property for the purpose in the immediate vicinity if that were possible. It was imperative that they should preserve in the public mind the idea that patients mentally afflicted were going to the Infirmary for treatment, and for that reason the place for treatment must be close to the Infirmary. Too much prominence should not be given to the question of clinical teaching in connection with the question; let them establish a strong enough case for the construction of such wards, and clinical teaching would follow as a matter of course. He was sure that the managers of the Royal Infirmary would give the most sympathetic consideration to the matter which had been so strongly brought before them.

Dr CLOUSTON said that of the two hundred admissions to Morningside during the last two years, over eighty patients

were discharged as recovered within the six weeks spoken of by Sir John Sibbald, and, estimating those who were discharged at two months or two and a half months, that would give them something like one hundred and sixty cases discharged as cured. These statistics showed that it would be a very economical measure on the part of the Parish Council to enter into some kind of business arrangement with the Royal Infirmary whereby every patient sent for treatment to the wards of the Infirmary should be paid for at the rate of £50 a year. This would ease enormously the pecuniary strain on the Infirmary, and at the same time prevent the rates being burdened by such cases becoming chronic. Then again, one-fourth of the cases sent to asylums were transitory in character and could be treated to recovery in the wards of the Royal Infirmary. Such a scheme would place within the reach of the poorer classes the benefits of treatment by the psychiatric doctor in the early stages of mental disorder such as were enjoyed as a matter of course by the richer classes. If such wards were established there must be in them the best physicians, those who had devoted themselves to that kind of practice. The London Hospital scheme referred to by Sir John Batty Tuke was not intended to be an attachment of the London hospitals, and it differed therefore in that respect from their scheme. He did not think that the carrying out of such a scheme as was proposed would interfere in any way with the general working of the hospital or affect it at all injuriously. They were not asking the managers of the Infirmary to embark on anything new, but only to extend and amplify such treatment as cases now received in Ward 6. As regarded the clinical teaching, he was not going to talk about it in an apologetic way. It was perhaps natural that Sir John Sibbald should bring out some of the weak points in the clinical teaching of mental disorders, but it had enormously improved of late years. The institution of such wards would be a very valuable thing for the medical student and would be an important addition to the resources at present available in asylums for the teaching of mental diseases. He estimated that about forty beds would be necessary; this would provide accommodation for twenty patients of each sex.

Dr ALEXANDER BRUCE then spoke in support of the scheme. Having had charge of Ward 6 in the Edinburgh

Royal Infirmary for six or seven years, he had a thorough appreciation of the difficulties experienced in giving proper treatment to the many cases of incipient mental disease which came so frequently under his notice. He had great sympathy also with the difficulties of the general practitioner in dealing with such cases under the present condition of things. It was often found necessary, for the safety of the patient, or at least for the mental comfort of those related to him, to sign a certificate of insanity for transference to an asylum before the symptoms were fully developed. Many a medical man shrank from incurring such a responsibility, and yet was forced to take action of some kind. Dr Bruce, after dwelling on the various steps that must be taken before a patient could be safely consigned to the asylum and the consequent delay involved, went on to say that he had in many cases, not without the feeling of trepidation confessed to by Dr Affleck, ventured to admit such patients to Ward 6, where he had been able, without undue strain on the resources of the ward, to give them such treatment as they required, with most satisfactory results. He knew that in doing so he was stretching to the utmost the powers entrusted to him, but one had to endeavour to meet the existing difficulties in some way till some such scheme as was now being put forward was in operation. When such a ward was provided, there would be no complications, no delay; the patient would be admitted and put under proper treatment in the shortest possible time, and his chances of complete recovery thereby increased. He (Dr Bruce) remembered receiving, in the early part of his time in the Infirmary, a letter from a patient some three weeks after he had been sent to the asylum, bitterly reproaching him (Dr Bruce) for having sent him there and thereby fixing upon him for all time the stigma of insanity. He thought that one of the strongest arguments that could be brought forward in support of the scheme.

Dr H. M. CHURCH said that, as a general practitioner, as one who had always felt the peculiar difficulties in treating mental affections, as one who realised the great responsibility incurred in signing a lunacy certificate, he should like to make a few remarks on the treatment of incipient and transient mental disorder. Many such cases had occurred in his practice, some of which, he thought might have had a more satisfactory

course had milder treatment and more patience been employed. Experience had shown them that drastic measures were not by any means always necessary in treating cases of mental disorder.

Dr URQUHART (Perth) said he believed the speakers had been preaching to the converted, for the members of the Society were of one mind as to the establishment of a psychiatric clinique in the Royal Infirmary of Edinburgh. He was sure they all hoped this would be a historical day for Scotland. It might be thought that they were finding fault with the existing state of things unreasonably, but it was their duty to remember that other countries were pressing forward with the adoption of new methods, and Scotland was in some danger of falling behind. He was sure that if such a clinique were established at the Royal Infirmary they would have splendid results, not only in regard to the education of students and to the better knowledge of medical men resulting from intimate contact with these cases in the Infirmary, but in regard to the ratepayers' pockets. The Society was naturally intensely interested in the medical aspect of the case. The scheme could be worked on simple lines. There would be no need to make a farm of the Meadows or have a brass band in front of their pavilion. Of course there must be open-air treatment; the patients who were to be treated in those wards would require the sun and fresh air. When one visited Dr Philip's patients at the Victoria Hospital, one found them in a garden, and why not at the Edinburgh Royal Infirmary? He was very glad that Dr Clouston had taken the opportunity to remind the Society that the Edinburgh Infirmary did at one time treat the insane within its walls. Circumstances altered and the insane were removed, but now that circumstances had again altered, he thought the time had come when the Infirmary might well undertake the care of incipient cases. He saw no great difficulties in the way except those of space and the limitation of cost, which no doubt could be easily overcome. There was no difficulty, at any rate, as regarded the opinion of the Medico-Chirurgical Society in regard to the necessity for some measure of this kind.

Dr CARSWELL, adviser in lunacy to Glasgow Parish Council, said he should like to lay before the meeting the details of a scheme which that body had had in operation for

several years, and which it was now about to put upon a permanent footing for the treatment of insanity in its early stages. Unless they in Edinburgh made haste to take action in the matter which they were now discussing, Glasgow would be the first city in Scotland to have a psychiatric ward in active operation. The Glasgow Parish Council had now in contemplation to build a mental block in connection with one of their hospitals, within easy reach of the University, which should provide accommodation for fifty patients. The appointment of a visiting physician to that psychiatric ward had already been made, and it was intended that the patients should be treated on hospital lines. During the last three years the number of patients that had passed through their hands had exceeded 200 each year. Last year, 212 patients were treated; this year he thought it would be something like 249. Of the 212 patients last year, 28 had eventually to go to the asylum, 10 died, 167 were discharged cured, and 7 remained under treatment at the end of the year. With better facilities, with a more systematised method of managing their patients, with a resident physician and a visiting physician and a regular system of nursing, he believed they would be able to pass through these wards something like 300 patients per annum, or more than one-third of the cases of mental disorder. The Parish Council hoped also to establish an outdoor clinique. He was sure that a scheme such as theirs, properly dealt with and properly gone into, would result in preventing a large proportion of mental cases ever reaching the stage when asylum treatment became necessary. He heartily wished the Edinburgh scheme all success.

Mr W. B. BLAIKIE said that it would be of great assistance to the managers of the Royal Infirmary in their consideration of the scheme if they had some idea of how much ground space would be required to satisfy the needs of the case.

Sir JOHN SIBBALD, replying to Mr Blaikie's question, said that according to the law and according to his own idea, no more land would be required for those wards than for any other wards in the Infirmary.

Dr CARSWELL said that 2000 cubic feet per bed would be allowed in their new wards in Glasgow, no outside space being provided at all.

Sir JOHN BATTY TUKE then formally moved the following

resolution: "That this meeting urges strongly on the managers of the Royal Infirmary the propriety of seriously considering the expediency of providing wards within or in the immediate vicinity of the institution for the treatment of incipient, transient, and recent cases of insanity."

The MASTER OF POLWARTH seconded, and the motion was unanimously adopted.

Dr WILSON, Mavisbank, said he had been pleased to hear the remarks of Dr Bruce and Dr Affleck in regard to their experience of the treatment of incipient cases in the Infirmary. If it were found impossible in the meantime to establish a special institution for such cases, he hoped that some modification might be made in the rules of the Infirmary as at present existing as would sanction their admission to the general wards. In his opinion, the Parish Council were absolutely bound to give this project their very careful consideration.

Sir JOHN SIBBALD in a few words thanked the members present for the kind attention they had given to his paper. He feared it was inadequate, but he had tried to confine himself strictly to say only what was thoroughly practical and necessary, so as to allow other people an opportunity of expressing their opinions.

Professor RANKINE, K.C., mentioned that a committee of the Infirmary managers had been appointed to meet with the committee appointed by the Society on the occasion of their last meeting, to consider, in the first place, the propriety and the feasibility of a psychiatric ward. They had already looked into the question of locale, and it seemed *prima facie* as if it would be impossible to have mental wards within the walls of the Infirmary.

Dr CLOUSTON said that a meeting would be arranged for in a few days.

Meeting VII.—March 5th, 1902

PROFESSOR T. R. FRASER, M.D., LL.D., *President, in the Chair*

I. EXHIBITION OF PATIENTS

1. *Dr Edwin Bramwell* exhibited a case of MERALGIA PARESTHETICA (BERNHARDT'S SENSIBILITÄTSSTÖRUNG). For

permission to show the case his acknowledgments were due to Mr Alexis Thomson and Dr F. D. Boyd. The patient, a miner aged 43, for eighteen months had suffered from pain over the right hip and over the lower part of the right thigh anteriorly, also from a feeling of coldness on the outer side of the right thigh. The pain was greatly increased by walking and was so severe that it had incapacitated him from work. In other respects he enjoyed excellent health; he had not had rheumatism nor syphilis. The condition was attributed to sleeping on hard boards in damp clothes.

Upon examination, an area of relative cutaneous anæsthesia was found on the outer side of the right thigh, while there was marked tenderness on pressure over a point an inch and a half below and just external to the right anterior superior iliac spine. An exhaustive examination failed to elicit any other objective signs of disease; the patient's symptoms were obviously referable to the right external cutaneous nerve.

Since no improvement resulted from rest in bed and Faradism, Mr Thomson cut down upon the nerve at the level of Poupart's ligament and excised three inches. The nerve and its relations appeared to be normal. As an immediate consequence of the operation, the pain which had previously been present, even when the patient lay in bed, disappeared.

Dr Bramwell showed photographs to illustrate the area of anæsthesia produced by division of the nerve. For two or three weeks after the operation the patient complained of a feeling of tenderness on deep pressure over this area. Four weeks after the operation he was quite free from pain, but still had a feeling of stiffness about the front of the right thigh.

The excised nerve was placed directly in 5 per cent. formalin. No degenerated fibres were to be seen in sections stained by the methods of Busch and Weigert.

Meralgia paresthetica is a distinct clinical entity. It is probably not uncommon. Roth, for example, has recorded fifteen personal observations. The condition is not generally recognised, but is well worthy of notice if only for purposes of exclusion in differential diagnosis. Further, cases occur where the pain is so severe as to unfit the patient for work.

The pathology is obscure. It may be that in some cases it is merely a neuralgia, in others a neuritis.

Faradism appears to have been efficacious in the treatment of several of the reported cases. Resection of the nerve is only justifiable in severe and persistent cases.

2. *Mr F. M. Caird* exhibited a man, aged 68, from whom he had removed 40 inches of small intestine on account of tuberculous stricture and associated infected mesenteric glands. The patient had suffered from gastric catarrh and colic since 1895, with more or less intermission, and especially during the last nine weeks. He had always been constipated. He was much troubled with flatulence, borborygmi, and distension. There was a large mass extending from below the left costal margin to the umbilicus, mobile to a small extent, and nonadherent to the abdominal wall. The left linea semilunaris was incised, and a mass of small intestine, omentum, and mesenteric glands was exposed. A free loop of greatly dilated gut was found above, and a similar one very much atrophied was isolated below; clamps were applied, and the intermediate area was removed. It was adherent to the descending colon. End to end suture was then used, and the abdomen closed.

Operation, 19th December 1901. The patient made a good recovery after an attack of diarrhœa, and got out of bed on 21st January. He is now hale and well.

3. *Dr Byrom Bramwell* exhibited two cases of great clinical interest.

CASE A.—*Tabes with acutely developed ataxia, in which great and rapid improvement had resulted from Frenkel's plan of treatment.*

The patient was a married man, aged 34; for five years he had been a barman, and for sixteen years previously a ship-steward. He was admitted to the Edinburgh Royal Infirmary on 22nd January 1902, because of inability to stand and walk.

He had enjoyed good health until the present illness commenced. He absolutely denied syphilis and gonorrhœa. There was no suspicion of alcoholic excess; his average allowance of alcohol was four glasses of beer per week; he did not take more than twelve glasses of whisky per annum He was not a heavy smoker.

For six months, before the inability to walk developed,

he had had some, but only slight, shooting pains in the legs, more especially the left leg, which was sometimes swollen at night, the result, he thought, of varicose veins. He had occasionally experienced a dull pain in the back, and some little difficulty in micturition, having to "force" a little to get the urine away.

The inability to walk developed rapidly on 13th January 1902. For a fortnight, before this date, he had felt some stiffness, and pins and needles in his legs and feet, but had no difficulty in walking in the dark. He was in the habit of walking from his place of business to his house—a distance of about a mile—every night at twelve o'clock. On Sunday, 12th January, he walked three miles. On Monday, 13th January, he had great difficulty in walking from one room to another. On 14th January he was quite unable to stand and walk.

On examination it was found that the inability to stand and walk was due to ataxia. There was no paralysis. The muscularity of the legs was good. The movements of the legs were wildly ataxic. There was no ataxia in the arms. When the eyes were closed there was total loss of the sense of position, both during and after passive movements, in the lower extremities. Occasional shooting (lightning) pains were complained of in the legs (thighs and calves). There was some varicosity of the veins of the left leg. The left calf measured 12½ inches and the right 11¾ inches—the patient was a short, spare man.

The knee-jerks and Achilles-jerks were completely absent even after reinforcement; the deep reflexes in the upper extremities were present but not exaggerated; the jaw-jerk was present. The direct muscular excitability of the anterior and posterior leg muscles and of the quadriceps group was slightly increased; there was no myoidena contraction. The plantar reflex was very active in both legs, the toe movement being flexion; the cremasteric reflex was absent on both sides; the abdominal reflex was present but slight.

The pupils were unequal in size and markedly dilated, the right measured 8 and the left 10 millimetres; they were quite insensible to light, and only contracted very slightly on accommodation, the right pupil becoming 6 and the left 8 millimetres in size; they did not dilate on powerful stimulation (pinching and faradic irritation) of the skin of the neck.

There was well marked thoracic and ulnar analgesia; and considerable analgesia and anæsthesia of the lower extremities. Biernacki's sign was not present. There was also marked analgesia of the calf muscles. There was some, but only slight, hypotonia. There was no girdle sensation. A slight dull pain in the "small of the back" was occasionally experienced.

Slight difficulty in micturition (necessitating "forcing") was occasionally experienced; the bowels were regular; there was little or no loss of sexual desire and power.

There had never been diplopia or ptosis; the ocular movements and the optic discs were normal; the special senses were normal; there were no crises and no trophic or vasomotor derangements. The mental functions were unimpaired, there was no articulatory defect, and no facial or tongue tremors.

The case was interesting because of:—(1) The absolute, and apparently quite straightforward, denial of syphilis and gonorrhœa. (2) The acuteness with which the ataxia had been developed; Dr Bramwell had lately analysed 155 cases of tabes which had come under his notice, in 3 of these cases only was the ataxia very rapidly developed. (3) The dilated condition of the pupils. In 104 of the 155 cases of tabes which Dr Bramwell had analysed, the size of the pupils was mentioned in the notes. In 69 of these 104 cases, or 66·3 per cent., the pupils were contracted (below 3 millimetres); in 27 cases, or 25·9 per cent. of medium size (between 5 and 3 millimetres); and in only 8, or 7·6 per cent., dilated (above 5 millimetres). (4) The striking and rapid improvement which had resulted from Frenkel's plan of treatment. On 22nd January the patient was unable to stand or walk, the movements of the legs being wildly ataxic. Frenkel's treatment (exercises with cross boards) was commenced on 27th January. In the course of ten days (on 7th February) the patient was able to stand and walk with the help of a go-cart. A week later (14th February) he was able to walk with the help of two sticks. He could now (5th March) walk steadily and well with sticks, and he could also walk across the room fairly well and without a marked ataxic gait, without sticks, *i.e.* totally unsupported.

CASE B.—*A case of complete consolidation of the left lung which presented great diagnostic difficulties.*

The patient, a married man, aged 57, a cellarman by

occupation, was admitted to the Edinburgh Royal Infirmary on 28th January 1902, complaining of great shortness of breath on exertion, debility, hoarseness of voice, a troublesome, hoarse cough, and some pain in the left hypochondriac and infra-axillary regions.

The illness had commenced seven months previously. There had been very little expectoration, but the patient had lost weight and had had some sweating at night. At first he denied syphilis, but subsequently admitted that he had had a hard chancre followed by secondary symptoms eight years ago. When 37 years of age (twenty years ago) he had had rheumatic fever. For the past twenty years he had occasionally suffered from sciatica and from what he termed rheumatic pains in the legs. These pains do not appear to have been lightning pains.

On admission he was found to be very debilitated and considerably emaciated (height 5 ft. 5½ ins.; weight 9 st. 7 lbs.); the temperature was 99·2°; the pulse 96. He was not anæmic and did not look cachectic; there was some cyanosis of the face and lips.

The whole of the left chest from top to bottom was dull on percussion. At the base of the left lung, the dulness was less absolute than one would expect in a case of pleuritic effusion, and hypodermic exploration showed that there was no fluid. Over the greater part of the left lung, loud bronchial breathing, the expiratory sound being particularly well marked, and increased vocal resonance were present. There were no moist sounds over any part of the left lung. The dulness was clearly due to consolidation of the lung.

At the level of the nipple, the left chest measured half an inch more than the right (13¾ and 13¼ respectively).

There was some impairment of the percussion note between the *right* scapula and the spine, and over this area and all down the right side of the spinal column a systolic murmur was audible.

Indistinct pulsation could be felt in the 2nd and 3rd left interspaces close to the sternum.

Over the manubrium sterni and in the 2nd and 3rd interspaces, both right and left, a systolic murmur and accentuated aortic second sound were audible; the murmur and accentuation were much louder in the 2nd and 3rd left interspaces

than on the corresponding point on the right side. Loud, blowing, tubular breathing was audible over the manubrium sterni and especially under the left sterno-clavicular articulation.

The heart appeared to be of normal size; the mitral sounds were normal.

The radial arteries were thickened and somewhat atherosed. The left radial pulse was somewhat smaller and the apex of the upstroke in the sphygmographic tracing less sharp than that of the right.

The veins in both upper extremities and on both sides of the neck, but especially on the left side of the neck and of the left arm, were somewhat engorged.

The left vocal cord was fixed and immobile. There was no difficulty in swallowing. The pupils were contracted and usually equal (3 millimetres in size), but occasionally the left pupil was much more contracted (2 millimetres). No tracheal tugging could be detected. The contraction of the pupils to light was somewhat sluggish.

There were no enlarged glands either in the neck or axillæ.

The red corpuscles were slightly reduced in number, normal appearance; the white corpuscles numbered 23,000 per cubic millimetre, *i.e.*, marked leucocytosis was present.

The deep reflexes were altered in a very interesting way. The right knee-jerk was active, the left absent even after reinforcement; both Achilles-jerks were absent. This condition of the reflexes was highly suggestive of previous syphilis, and on cross-examining the patient he admitted (though he had previously denied it) that eight years previously he had a hard chancre followed by secondary symptoms.

The X-ray examination gave no definite information. The picture which was obtained, both on the screen and in the photographic negative, was very indistinct. It showed complete consolidation of the left lung, and some opacity to the right of the spinal column, between the right scapula and the middle line, and below this point to the base of the right chest. Dr Dawson Turner, who made the examination, could give no opinion as to the nature of the lung consolidation, or as to the presence or absence of an aneurism.

The diagnosis was extremely difficult. The dulness was

clearly due to consolidation of the lung; there did not appear to be any fluid in the pleural cavity. Most of the competent observers who had examined the case were of opinion that the consolidation was due to malignant disease of the lung and mediastinal glands. Dr Bramwell found it difficult to accept this opinion. He had never seen such extensive consolidation the result of malignant disease of the lung without much more cachexia anæmia. Dr Bramwell thought that the consolidation of the left lung was probably due to aneurismal pressure on its root. There certainly seemed to be arterial and aortic disease. The patient had had syphilis, and the condition of the reflexes was suggestive of a post-syphilitic lesion. The absence of anæmia and cachexia and of any glandular enlargement at the root of the neck was against malignant disease. On the other hand, the absence of tracheal tugging and of difficulty in swallowing was against aneurism. The paralysis of the left vocal cord, the difference in the pulses and pupils were rather in favour of aneurism, though they might, of course, be due to a mediastinal new growth. It was difficult to reconcile the greater measurement of the left chest (half an inch more than the right) with aneurismal pressure on the left bronchus and resulting consolidation of the lung. In other cases of this kind which had come under Dr Bramwell's notice, the left lung had always been more or less collapsed. The leucocytosis was at first sight strongly in favour of a new growth, for leucocytosis is usually a marked feature in malignant disease of the lung, but is not present in uncomplicated cases of thoracic aneurism. Dr Bramwell was, however, of opinion that the leucocytosis could quite well be accounted for by the condition of the lung, granting that the consolidation was the result of aneurismal pressure on the root. He had seen, either during life or in the post-mortem room, several cases in which consolidation of the left lung had been produced in this way; in some cases, the lung had been completely solidified, and catarrhal and inflammatory changes, in one case going on to gangrene, had developed in it. Such a condition of the lung would account for the leucocytosis. The point was of considerable diagnostic interest; so far as he knew there were no recorded observations regarding it—the condition of the blood in aneurism with consolidation of the left lung due to pressure on the root.

The course of the case during the time that the patient had been under treatment (rest and iodide of potassium), was, Dr Bramwell thought, in favour of an aneurism rather than of a new growth. In the course of five weeks, the patient had gained 7½ lbs. in weight; the leucocytes had dropped from 28,000 to 9800 per cubic milimetre (the red corpuscles now numbered 4,300,000 and the hæmoglobin equalled 75 per cent.); the pain in the left side had disappeared, the dyspnœa was rather less, and the patient had gained strength. The pulse had remained quick (average about 100), the temperature was usually normal though occasionally somewhat elevated; there had been very little expectoration. During the past three or four days, the patient had spat a small quantity of thick, tenacious, dark-brown sputum. Microscopical examination of the sputum showed numerous large cells with well-marked nuclei, many of the cells contained pigment particles derived from the lung, others fatty granules. The character of the cells was not distinctive; they might be merely swollen catarrhal cells derived from the bronchi or air cells; they might be derived from a new growth (carcinoma or large-celled sarcoma); the pigmented character of some of the cells was perhaps in favour of the former view.

Taking the whole of the facts of the case into consideration Dr Bramwell thought that the consolidation of the lung was probably due to aneurismal pressure on its root; but he admitted that the diagnosis presented great difficulty.

Subsequent Note: Post-mortem Examination.—The patient died suddenly on March 12th. The post-mortem examination showed that the lesion was a large new growth which involved the bronchial glands and root of the left lung, and extended along the root of the lung and bronchi into the lung tissue. The root of the left lung was surrounded and compressed by the new growth, the left bronchus being completely occluded. The lung tissue which was not infiltrated with the new growth was consolidated and airless, and presented to the naked eye exactly the same characters which one sees in those cases in which chronic inflammatory consolidation results from pressure of an aneurism on the root of the lung.

The transverse part of the aortic arch and the commencement of the descending thoracic aorta were embedded in, and

completely surrounded by, the new growth. There was no disease of the aorta and no disease of the heart.

II. Exhibition of Apparatus

Mr Alexander Miles exhibited a NEW SPLINT devised by him which can be adapted for use either as a single or as a double inclined plane.

III. Exhibition of Pathological Specimens

1. *Mr F. M. Caird* exhibited an INTESTINAL TUBERCULOUS STRICTURE removed from the patient whom he exhibited at this meeting. Also drawings of the same. The condition was one of very narrow stricture due to hyperplastic tubercle. Other two strictures were seen in course of formation a few inches above the main fibrous mass.

2. *Mr David Wallace, C.M.G.*, exhibited—

(*a*) ADENO-CARCINOMA.

Kidney I.—Mrs M., æt. 30, married. First noticed blood in urine in *February* 1901. From that date at intervals of two or three weeks bleeding recurred, and lasted on each occasion for three or four days. Usually bleeding worst at menstruation.

In June 1901.—Clots observed for first time, and bleeding persisted longer. Clots like strings. At this date also pain in right loin, and frequency of micturition.

In August, when patient first seen, she was very anæmic, and the urine contained much blood. Right kidney easily palpable, movable and irregular in shape.

Urine.—Sp. gr. 1020. No tube casts nor special cells. Amt.: 40 ounces daily, and always contained much blood.

Preliminary treatment to operation. Chloride of calcium, grs. 15. Thrice daily for a week.

Operation on 13*th August.*—Lumbar incision. Kidney readily excised. Wound healed by first intention. Patient out of bed on 12*th day* and left for home on 21*st day* after operation.

Result. March 1902. No recurrence.

Microscopical examination of tumour showed it to be an Adeno-carcinoma.

N.B.—Note peculiar process of tumour which filled the pelvis of kidney.

(*b*) SARCOMA OF KIDNEY.

Kidney II.—*History.*—Mr H., æt. 50 years. One year ago had blood in urine for a week from no recognisable cause.

Symptomless hæmaturia. No further bleeding until six weeks ago, but since then has lost much blood, and the urine has never been clear.

Varicose Veins and Varicocele have appeared on left side during last three months, and are extremely marked. (This a somewhat unusual but recognised condition resulting from renal neoplasm.

Left kidney readily palpable, very irregular on surface, not painful. Much enlarged.

Cystoscopy.—Bladder healthy. Bleeding had ceased for twenty-four hours before examination, and nothing seen coming from ureteral openings.

Operation, 10th August 1901.—Lumbar incision. Extremely free hæmorrhage while separating kidney from its surroundings. A mass of tumour filled renal vein and pressed on inf. vena cava. This mass could not be removed, and was cut through when pedicle ligatured.

Result. 20th August—Healed by first intention, but a week later some serous discharge. A sinus persisted for several weeks.

1st September.—Walked down stairs. Varicosities almost gone.

14th October.—Patient quite well.

March 1902.—*Microscop.* Round celled sarcoma.

(*c*) POLYCYSTIC KIDNEY WITH TUBERCULOUS ABSCESS.

Kidney III.—*History.*—Mrs F., æt. 35 years, married. Twelve months ago complained for first time of a gnawing pain in her right side. This lasted for fourteen days. Ten months later, five weeks before admission to Ward 13, she observed (?) blood in the urine. There was no frequency, but some pain. Has been losing weight for some time. Now, 27th, August 1901, she has *deposit of pus in the urine*, but no blood.

Urine.—Sp. gr. 1020. Much pus, no blood. Tubercle bacilli present. Quantity of urine per day 40 oz.

Right kidney easily palpable. Tender on pressure, and irregular on surface. *Left kidney* not palpable.

Diagnosis.—Tuberculous kidney.

Operation, 3rd September 1901.—Lumbar incision. Kidney adherent at site of abscess to peritoneum, and during removal peritoneal cavity opened. Polycystic nature of tumour observed, but kidney excised because of abscess.

Result.—Wound healed by first intention and patient discharged at end of 14th day.

Urine secreted day after operation = 32 ounces, and averaged 30 ounces while patient in hospital.

March 1902.—Patient quite well and gained weight. The left kidney has become palpable.

(*d*) Portion of TUBERCULOUS INTESTINE. 33 inches of ileum, 11 inches cœcum and ascending colon.

History.—A. P., æt. 44, spinster. Suffered from chronic diarrhœa for four or five months and gradually lost weight. Stools contained mucus, and now and then a little blood. Never any definite obstruction. Tumour hard, and irregular felt in the right iliac fossa.

Diagnosis.—Carcinoma of cœcum.

Operation, June 1901.—The above specimen removed, and end to end anastomosis between ileum and transversal colon performed. Proximal and distal ends nearly equal in size. The cœcum was adherent to the anterior parietal peritoneum, a portion of which was removed.

Result.—Patient made a good recovery, and left hospital quite well three weeks after operation.

Note in Specimen.—1st, complete obliteration of lumen at junction of ileum and cœcum; 2nd, abnormal communication between ileum and ascending colon; 3rd, five different areas of contracted intestine (ileum) with dilatations between.

Microscopic examination showed condition to be *tuberculous.*

March 1902.—Patient well, but has sinus in scar of wound, possibly due to silk ligature. No fœcal fistula.

3. *Mr Alexander Miles* exhibited—

(*a*) The complete spine of a child 8 months' old, showing a SPINA-BIFIDA (*meningo-myelocœle*) in the lumbar region. The child had complete paralysis of the lower limbs and lower part of the trunk. Was treated by the injection of Morton's fluid

in October 1901, without benefit. Died in January 1902. Several stereoscopic photographs of the patient were also shown.

(*b*) MALIGNANT STRICTURE OF THE ŒSOPHAGUS from a man, æt. 69. The patient began to have difficulty in swallowing six months before admission to Leith Hospital, in January 1902. He rapidly lost weight. For two months previous to admission he vomited persistently immediately after taking food. For the last two weeks he was fed entirely per rectum. The stricture was about one inch long, and was situated about an inch and a half from the cardiac end of the stomach.

(*c*) VERMIFORM APPENDIX WHICH CONTAINED A PIN, from a girl, æt. 11, who had repeated atypical attacks of appendicitis during four years. On removal of the appendix it was found to contain an ordinary pin in its lumen. The pin lay with its head towards the tip of the appendix. It formed the nucleus of a long fæcal concretion. The patient recovered.

(*d*) VERMIFORM APPENDIX WHICH CAUSED ACUTE OBSTRUCTION OF THE BOWELS. The tip of the appendix had become attached to the mesentery of the small intestine. A loop of ileum passed under the band thus formed and became acutely strangulated. The appendix in turn was strangulated by being rotated on its long axis. It was excised, and the obstruction thereby relieved. The patient, a boy of 6, recovered.

(*e*) SEVEN OTHER VERMIFORM APPENDICES illustrative of the pathology of appendicitis.

4. *Dr Robert A. Fleming* exhibited microscopic demonstration of Regeneration of nerve fibres in the peripheral ends of un-united nerves eighteen weeks after section —and in the posterior tibial nerve of a fatal case of alcoholic PERIPHERAL NEURITIS.

The specimens shown were all stained with a modification of Strœbe's method (anilin blue and saffranin) which colours the axis cylinders blue and the nuclei bright red. The young axis cylinders are extremely fine and are evidently formed by the proliferated neurilemma nuclei which act as neuroblasts. The chains of these neuroblasts with their immature axis cylinders have an imbricated arrangement, but probably never

form connected lengths of new nerve fibre until the peripheral and central ends of divided nerves are brought together by suture. The myelin sheaths belonging to these young axis cylinders are not stained by this method and only appear as a clear space round the young axis cylinders.

A similar regeneration occurs in peripheral neuritis and probably recovery in these cases in part owes its tediousness to the length of time such regeneration requires.

VI. Original Communications

1. THE RELATIVE INEFFICACY OF CACODYLATES AS THERAPEUTIC AGENTS

By Thomas R. Fraser, M.D., LL.D., Pres. R.C.P.Ed., Professor of Materia Medica and of Clinical Medicine in the University of Edinburgh; President of the Medico-Chirurgical Society of Edinburgh

Compounds of cacodylic acid, $As(CH_3)_2O(OH)$, have recently been introduced into therapeutics as preparations of arsenic having certain advantages over the ordinarily employed medicinal compounds of that element. There has already been accumulated a considerable body of clinical experience regarding several of them, and especially regarding the cacodylate of soda and the cacodylate of iron.

The former of these compounds has been administered in nearly all affections in which it is customary to employ the ordinary compounds of arsenic, including anæmia, leucæmia, pseudo-leucæmia, many forms of skin disease, leprosy, lymphadenitis, phthisis, bronchitis, chorea and neurasthenia.

Almost without exception, those who have made observations with cacodylates have expressed themselves in the most favourable terms in regard to their value.

In a discussion at the Society of Hospital Physicians of Paris, Dalché (1) stated that of nine cases of pulmonary tuberculosis treated with cacodylate of sodium, subcutaneously injected, three were undeniably cured; four were greatly improved, having gained in weight and muscular strength; two showed no results; and two, which were very advanced cases, became worse.

Dr Anelli (2) has described a remarkable success in a case

of aggravated pulmonary tuberculosis, in which, as he had failed to obtain success with subcutaneous administration, he injected ·8 grain daily introvenously, and almost immediately thereafter improvement commenced, with a notable reduction in the temperature and respiratory movements; while at the end of three weeks the pulse-rate had fallen from 96 to from 80 to 85 per minute, the night sweats had sensibly diminished, the number of tubercle bacilli and staphylococci in the sputum had become greatly lessened, and elastic fibres had altogether disappeared.

Rocaz (3) treated eighty cases of tuberculosis, and found in pulmonary tuberculosis, excepting advanced cases, that cough, night sweats and pyrexia disappeared, and the body weight increased. He, however, makes the extraordinary statement that in cases of "latent, suspected or threatened tuberculosis, cacodyl triumphs." He asserts that one case of tubercular peritonitis was healed and three cases were improved.

Gallois (4), who had used cacodylate of sodium by mouth administration in a large number of diseases, claims that it almost invariably increased appetite and augmented weight, and that the condition most favourably influenced was chronic bronchitis with asthmatic paroxysms occurring in elderly people. He had also obtained good results in scrofula and eczema, but not in psoriasis. In his cases neither intolerance nor poisonous symptoms followed mouth administration. This freedom from inconvenient effects during mouth administration was also noted by Quelmé (5) in a number of cases of scrofula, when care was taken to interrupt the administration occasionally.

Ewart's (6) experience led him to conclude that cacodylates can be administered for a long time in moderate doses, and exert their "brilliant" effects in all cases where arsenic is indicated, especially in chorea, malaria, pernicious anæmia and Basedow's disease; also in the hectic fever and the cough and expectoration of phthisis, and in all nervous exhaustions.

Burlureaux (7) met with gratifying results in neurasthenia, chlorosis and psoriasis, but with little success in tuberculosis. In the former conditions, strength, appetite and weight were increased, toxic dyspepsia was cured, menstruation returned, and the growth of hair was stimulated.

Bormans (8) thus summarises his experience of the use of

cacodylate of soda in anæmia. It is a remedy which may be tolerated in much larger doses than those usually given, and therefore is valuable in all cases where large doses of arsenic are indicated, as in anæmia and chlorosis, especially where iron is not tolerated.

Danlos (9) obtained good results in pseudo-leucæmia and psoriasis; and Reynaud (10) was induced by the success obtained in the latter disease, and in lupus erythematosus, cutaneous tuberculosis and sarcoma of the skin, to try cacodylate of soda in leprosy, by subcutaneous injections of one and one-and-a-half grain daily. He states that the cachectic phenomena disappeared, and the body weight increased, and that, in four out of six cases, there was rapid cicatrisation of open sores and even of phagedenic ulcerations.

From his experience of the rectal and subcutaneous injection of cacodylate of soda in leucæmia, anæmia, exophthalmic goitre, diabetes and early tuberculosis, Renaut (11) concludes that this compound is superior to the ordinary preparations of arsenic, especially because of its almost absolute non-toxicity.

Gautier (12) points out that although the salts of cacodylic acid were introduced for the treatment of tuberculosis, their use has now been extended with beneficial results to all emaciating diseases, to severe anæsthesia, all skin diseases, scrofula and syphilis. In cachexias, whatever be their nature, in neurasthenia and in conditions of general weakness, the beneficial effect is a very apparent one. They do not act in any special disease, but in all weakened conditions, and the success is all the more remarkable because it is free from risk. The daily quantity he recommends for subcutaneous injection is ·05 gramme, equivalent to ·37 grain of arsenium, or 51 minims of liquor arsenicalis. Gautier, who has done important work on the chemistry of cacodylic compounds, believes that they act through the intermediary of the thyroid gland, which he has shown to be the only structure in the body where arsenic is normally present in considerable quantity. It is there united with iodine, and he affirms that the simultaneous administration of iodine increases the action of cacodylic compounds.

Cacodylate of sodium has been administered by the stomach and rectum, by subcutaneous injection, and occasionally by rectal and introvenous injection. In the first case, the dose *per diem* has usually been 0·1 gramme, or 1·5 grain, equivalent to

so large a quantity as 103 minims of liquor arsenicalis, but one gramme (15 grains) has also been given; while for subcutaneous injection, ·05 and ·1 gramme, or three-fourths of a grain and one grain-and-a-half, respectively, have been the doses most generally employed; although so enormous a dose as one gramme-and-a-half has also been injected with perfect impunity (12).

In some instances, the administration by subcutaneous injection has been continued, with or without interruptions, for so long periods as two, three, four, and six months, and even for two years, without the slightest symptom of poisoning, and although five-sixths of a grain of cacodylate of soda has at times happened to directly enter the veins during the injections. In the prolonged administration of the less frequently employed cacodylate of magnesium, so large a quantity as 43 grammes, or about 662 grains, representing about 300 grains of arsenium or 86 fluid ounces of liquor arsenicalis, has been received by a patient by subcutaneous injection in a period of three months, without any manifestation of arsenicism (7).

As one gramme of cacodylate of sodium contains 7·44 grains of arsenium, and represents 1030 minims or more than 2 fluid ounces of liquor arsenicalis, it is apparent that by using cacodylic compounds, extremely large quantities of arsenium may be introduced into the body without producing dangerous or even remarkably inconvenient effects. The claim is made, however, that the large introduction of arsenic that can thus be effected is of much advantage to therapeutics, and renders the cacodylic compounds more valuable than the compounds of arsenic that have hitherto been generally used in medicine.

It appeared to me that if cacodylic compounds are incapable of causing toxic effects when given in quantities greatly superior to the quantities of ordinarily employed arsenical compounds, they must, to a corresponding degree, be pharmacologically inert and therapeutically inefficient. In order to test this opinion, I have given cacodylate of soda and cacodylate of iron in cases of several of those diseases in which arsenic is frequently administered.

Chorea.—Taking first the disease, chorea, in which the value of the ordinary arsenical preparations has been abundantly demonstrated, cacodylate of soda was given to three patients with the following results:—

CASE I. Mona Y., æt. 9, has been ill for ten days before admission into the Royal Infirmary. After admission she remained untreated for four days before cacodylate of sodium was administered. The cacodylate treatment lasted for forty-five days, beginning with three-fourths of a grain (representing ·36 grain of arsenium), and gradually increasing to four grains and a half (representing 2·16 grains arsenium) *per diem.* No improvement occurred. The patient was then treated with liquor arsenicalis for ten days, the daily quantity being at first 9 minims (representing ·063 grain of arsenium), and latterly 12 minims (representing ·084 grain of arsenium). There was marked improvement in seven days, and the choreic movements had entirely disappeared on the tenth day of treatment with liquor arsenicalis.

CASE II. John D., æt. 9—*Hemichorea*—had been ill for four weeks, and received no treatment for chorea during the first eight days after entering the Royal Infirmary, but in this time the symptoms had considerably improved. He received for twenty-three days from 1 to 9 grains of cacodylate of soda daily (representing from ·48 to 4·32 grains of arsenium), when the administration was interrupted for five days by the occurrence of diarrhœa. On being resumed, cacodylate of sodium was given in daily quantities of from three-fourths of a grain to one grain-and-a-half for three days, but was then stopped on account of a return of diarrhœa. The choreic symptoms continued to lessen during the administration of cacodylate of sodium, and the patient had so far improved in thirty-one days, that no further medicinal treatment was required.

CASE III. William R., æt. 12, had been ill for ten days. On the day following his admission into hospital, cacodylate of sodium was administered, beginning with one grain-and-a-half, and slowly increasing to ten grains-and-a-half daily (representing from ·72 to 5 grains of arsenium). Scarcely any improvement was observed until twenty-eight days, but it was only slight, and had not materially advanced at the end of fifty-two days. Liquor arsenicalis was now substituted for cacodylate of soda, the beginning dose *per diem* being 6 minims (representing ·042 grain of arsenium), which was gradually increased to 12 minims (representing ·084 grain arsenium. In seven

days there was marked improvement, and recovery was established in twenty-one days.

In the next case of chorea, which was admitted at about the same time as the last, the treatment was with liquor arsenicalis only.

CASE IV. Robina L., æt. 15, had been ill for six months. On the day following admission into hospital, she was treated with liquor arsenicalis, the does being between 6 and 24 minims daily (representing ·048 and ·168 grain of arsenium), and this treatment was continued for thirty-two days. An improvement in the symptoms was noted on the seventh day of treatment with liquor arsenicalis, it had become very pronounced on the eleventh day, and entire recovery had been established by the twenty-third day.

In these cases mouth administration was followed. In the second case much disorder of the alimentary canal was produced, and in each patient treated with cacodylate of soda a strong garlic-like odour was developed, whereas the patient treated with only liquor arsenicalis manifested no symptom whatever of arsenicism, although very considerable doses of arsenic were given.

Eczema.—Since these observations with cacodylate had been begun, I have had an opportunity of testing their effects in only one case of skin disease.

CASE V. The patient was a young unmarried woman, Esther B., æt. 24, suffering from a second attack of acute eczema, which involved the whole surface of the body except the scalp. During the seventeen days preceding the administration of cacodylate of soda, material improvement, with disappearance of the more acute characters of the eczema, occurred under regulation of diet, purgatives, and exalgine. Cacodylate of soda was given for twenty-three days, then intermitted, because of nausea and vomiting, for four days, and again given for other two days. The daily quantity, administered by the mouth, was at first 3 grains (representing 1·44 grain of arsenium), and this was gradually increased to 15 grains (representing 7·2 grains of arsenium). The improvement in the condition of skin slowly proceeded, and the eczema

had disappeared twenty-nine days after the treatment with cacodylate of soda had been commenced. A strong garlic odour was developed after the third dose had been taken, and persistent nausea, with distaste for food and with occasional vomiting, occurred at the end of the third week. Although the administration had to be suspended because of the latter symptoms, it is of interest to note that at no time were there developed the most characteristic of the symptoms of arsenicism, such as conjunctival congestion, swelling of the eyelids and neuritis. In this as in other of the cases, it appeared to be indicated that the nausea, vomiting and anorexia were caused by the cacodylic oxide, whose odour was so unpleasantly conspicuous, rather than by any active arsenic liberated from the cacodylate.

Leucæmia.—One case of spleno-medullary leucæmia was treated with cacodylate of soda.

CASE VI. The patient, Henry C., æt. 40, was treated on two periods with cacodylate of soda given by the mouth. In the first period of twelve days, he received from 1 to 3 grains (representing ·48 and 1·44 grain of arsenium). At the beginning of treatment, the hæmocytes were 3,200,000 and the leucocytes 250,000 per cm., and the percentage of hæmoglobin was 42. At the end of the twelve days, the hæmocytes were 3,000,000 and the leucocytes 250,000 per cm., and the percentage of hæmoglobin was 39.

The occurrence of diarrhœa led to the administration of the cacodylate being interrupted for forty-two days, when other remedies were given, but without improving the condition of the blood.

On the resumption of treatment with cacodylates, constituting the second period, the sodium salt was administered by the mouth for twenty days, at first in daily quantities of 1 grain, and latterly of 6 grains (representing ·48 and 2·8 grains of arsenium). At the beginning of this second period, the hæmocytes were 2,200,000 and the leucocytes 282,000 per cm., and the percentage of hæmoglobin was 40. At the end of the twenty days, the hæmocytes were 2,500,000 and the leucocytes 340,000 per cm., and the percentage of hæmoglobin was 40.

This unfavourable result corresponds with the experience in leucæmia of Widal(13) and of Dalché(1), both of whom, however, state that the red blood corpuscles became increased in number.

Anæmia.—On the other hand, neither in this case nor in six cases of simple anæmia was any material increase produced in the hæmocytes. Even if cacodylates were effective preparations of arsenic, such an increase was not anticipated, for I had more than fifteen years ago definitely convinced myself that arsenical preparations are incapable of increasing either the red cells or the hæmoglobin in this disease. The administration, however, while it served to add to the evidence of this inability, supplied materials for the chemical determination of the fate of cacodylic compounds from the time of their introduction into the body to that of their elimination by the kidneys.

In the first five of the six cases of anæmia, cacodylate of soda was given by the mouth.

CASE VII. Nellie S., æt. 17. Treatment was begun two days after her admission to hospital, and was continued for twenty-one days, the initial dose of cacodylate of soda being ·5 grain (representing ·24 grain of arsenium), and the final maximal dose 3 grains (representing 1·4 grain of arsenium), each twenty-four hours. At the beginning of treatment, the hæmocytes numbered 3,000,000 per cm., and the percentage of hæmoglobin was 30. At the end of the twenty-one days, the hæmocytes numbered 3,500,000 per cm., and the percentage of hæmoglobin was 32. This trivial improvement in the quality of the blood is not more than frequently occurs in hospital when no effective medicinal treatment is employed. Immediately after suspending the administration of cacodylate of soda, this patient received ferrous chloride, first in doses of 2 grains and latterly of 4 grains, thrice daily. In sixteen days, the hæmocytes numbered 4,200,000 per cm., and the percentage of hæmoglobin was 62; and in twenty-five days, the hæmocytes numbered 4,600,000 per cm., while the percentage of hæmoglobin was 72.

CASE VIII. Marion M'L., æt. 19, was kept under observation in hospital for ten days before the administration of

cacodylate of soda was begun. She received during forty-eight days daily quantities of from 1 grain to 18 grains (representing ·48 grain and 8·64 grains of arsenium). At the beginning of this treatment, the hæmocytes numbered 3,330,000 per cm., and the percentage of hæmoglobin was 32; at the end of the forty-eight days the hæmocytes numbered 3,430,000 per cm., and the percentage of hæmoglobin was still 32.

She then received ferrous chloride, commencing with 2 grains, which was soon increased to 4 grains, thrice daily. In twenty-one days, the hæmocytes numbered 5,500,000 per cm., and the percentage of hæmoglobin was 90.

CASE IX. Jane B., æt. 21. Nine days after her admission to hospital, treatment with cacodylate of soda was begun, and it was continued for forty-three days, the initial doses being ·75 grain (representing ·36 grain of arsenium), which was gradually raised to 15 grains (representing 7·2 grains of arsenium) *per diem*. When treatment was commenced, the hæmocytes numbered 4,000,000 per cm., and the percentage of hæmoglobin was 48. At the end of forty-three days, the hæmocytes numbered 4,800,000 per cm., and the percentage of hæmoglobin was still 48.

Ferrous chloride was now substituted for cacodylate of soda, the doses ranging from 2 grains to 4 grains thrice daily. In thirty-seven days, the hæmocytes numbered 5,500,000 per cm., and the percentage of hæmoglobin was 100.

CASE X. Mary R., æt. 18. After eight days of observation in hospital, this patient was treated for forty-four days with cacodylate of soda, in daily doses which ranged from 1 grain to 9 grains (representing ·48 grain and 4·3 grains of arsenium). When the treatment was begun, the hæmocytes numbered 3,660,000 per cm., and the percentage of the hæmoglobin was 42. At the end of forty-four days, the hæmocytes numbered 4,500,000 per cm., and the percentage of hæmoglobin was 44.

After an interval of eight days without any medicinal treatment, this patient received ferrous chloride in doses of from 2 to 4 grains thrice daily. In eighteen days thereafter, the hæmocytes numbered 5,000,000 per cm., and the percentage of hæmoglobin was 67; and in twenty-six days the number

of hæmocytes was 5,200,000 per cm., and the percentage of hæmoglobin was 80.

CASE XI. Jeannie G., æt. 15, was kept under observation for eight days before treatment with cacodylate of soda was begun. During twenty-six days, she received from 3 to 12 grains daily (representing 1·4 grain and 5·7 grains respectively of arsenium). Before treatment, the hæmocytes numbered 3,400,000 per cm., and the percentage of hæmoglobin was 30. At the end of twenty-six days, the hæmocytes numbered 3,800,000 per cm., and the percentage of hæmoglobin was 30.

Ferrous chloride was then substituted for sodium cacodylate, in doses of 2 to 4 grains thrice daily. In thirty days, the number of hæmocytes was 4,650,000 per cm., and the percentage of hæmoglobin was 80.

In the next case, subcutaneous injection was substituted for mouth administration of the cacodylic salt, but the therapeutic result was equally unsatisfactory.

CASE XII. Annie A., æt. 16. After having been kept under observation for seventeen days, during which time the quality of the blood, especially in regard to the number of hæmocytes, improved steadily, this patient was treated for forty-five days with cacodylate of soda, which was subcutaneously injected in daily doses rising from ·166 grain to 12 grains (representing ·08 grain and 5·76 grains of arsenium). When the injections were commenced, the number of the hæmocytes was 4,800,000 per cm., and the percentage of hæmoglobin was 42. At the end of forty-five days the number of the hæmocytes was 5,170,000 per cm., and the percentage of hæmoglobin was 50.

The injections of cacodylate of soda were now stopped, and ferrous chloride was administered by the mouth, the daily doses ranging from 6 to 12 grains. In twenty-seven days, the number of the hæmocytes was 5,320,000 per cm., and the percentage of hæmoglobin was 70; and in fifty days, the number of hæmocytes was 5,050,000 per cm., and the percentage of hæmoglobin was 94.

In this case, cacodylate of soda was well tolerated when

subcutaneously injected. No gastric or intestinal disturbance was produced, and there were no symptoms of arsenical poisoning, although so enormous a dose was frequently given each day by subcutaneous injection as 12 grains, representing more than 5½ grains of arsenium, or 840 minims, or an ounce and three-quarters of liquor arsenicalis. Indeed, the only obvious result of the administration was the development of an alliaceous odour, which, however, did not become manifest until late in the treatment, when the larger doses were being injected.

The subcutaneous injection of a substance whose action depends on its diffusion throughout the body is one of the most certain methods for inducing that action. It has, however, failed to show that cacodylate of soda possesses any pharmacological or poisonous action even when very large doses of it are injected.

The cases in which cacodylate of soda has been given by mouth administration as well as by subcutaneous injection have also shown that this salt is unable to produce any definite therapeutic effect in anæmia.

On the other hand, when cacodylate of iron is administered in place of cacodylate of soda, anæmia is unmistakably benefited, as the following case exemplifies.

CASE XIII. Isabella M., æt. 22, was kept under observation for eleven days, during which time only slight improvement took place in the state of her blood. She then received cacodylate of iron by mouth administration in quantities at first of 3 grains (representing about 1·4 grain of arsenium and ·36 grain of iron), and latterly of 15 grains (representing about 7·2 grains of arsenium and 1·8 grain of iron), daily. When this treatment was begun the number of hæmocytes was 3,400,000 per cm., and the percentage of hæmoglobin was 37. Undoubted, although not rapid, improvement occurred. In thirty-six days the number of the hæmocytes was 4,550,000 per cm., and the percentage of hæmoglobin was 66; and in sixty-eight days these numbers had increased to 5,000,000 and 89, respectively. This salt of cacodylic acid was well tolerated, as the only inconvenience which it caused was a slight alliaceous odour that became apparent so early as the second day of treatment.

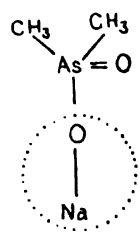
A similar success in anæmia with cacodylate of iron has been recorded by Gilbert and Lereboullet (14); but, apparently, they attribute the simultaneous increase of the hæmocytes and hæmoglobin to a combination of the action of arsenic with that of iron in this compound, believing that the increase of the hæmocytes is mainly caused by the arsenic, and of the hæmoglobin by the iron. This combination of therapeutic effects, however, is merely the ordinary result which follows the administration of any efficient compound of iron. It is illustrated in the following case of a patient who suffered from anæmia, and was treated only with ferrous chloride, at the same time as the patient whose case has last been described.

CASE XIV. Kate D., æt. 24, after having been under observation for seven days, was treated with ferrous chloride, in doses at first of 2 grains, and soon afterwards of 4 grains, thrice daily. When this treatment was begun, the number of the hæmocytes was 3,500,000 per cm., and the percentage of hæmoglobin was 39. In twenty-one days, the number of the hæmocytes was 4,200,000 per cm., and the percentage of hæmoglobin was 80; while in thirty-five days, the numbers were 4,600,000 and 88, respectively.

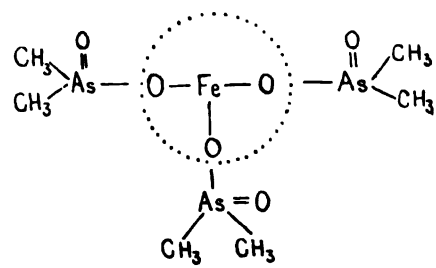
It thus appears that the arsenic in cacodylic acid and in its salts is almost inert when regarded either as a therapeutic or as a poisonous substance, but that when certain bases having therapeutic properties, such as iron, are united with cacodylic acid, these bases (for this has also been shown with mercury) are capable of producing their special curative effects.

These results are rendered intelligible when the chemical properties of cacodylic acid and its compounds are considered. It is found, for example, that the well-known reactions of the ordinary arsenical compounds are not displayed by cacodylates, while the reactions of the bases referred to can readily be produced. Cacodylates, though arsenate compounds, fail to give the characteristic reactions of sodium arsenate, as with silver nitrate, zinc sulphate, and a mixture of ammonia, ammonium chloride and magnesium sulphate. In marked contrast with sodium arsenate, the cacodylate of soda also fails to produce a deposit of arsenium upon copper, when it is subjected to Reinsch's process.

On the other hand, cacodylate of iron gives the numerous ordinary reactions of all solutions of ferric compounds, as with hydrogen sulphide, potassium hydroxide, ferrocyanide of potassium and tannic acid. As contrasted with the iron, the arsenic is thus shown to be so firmly united with other elements in the cacodylic group as to be incapable of disassociation by chemical reagents of much greater activity than those which it could encounter in the living body. The following formulæ, illustrating the chemical constitution of the sodium and the iron cacodylate, may serve to explain how the disassociation of the basic sodium and iron may be effected, while the arsenic in the compound still remains so firmly united with methyl as to be incapable of forming any active arsenic ion :—



Sodium Cacodylate

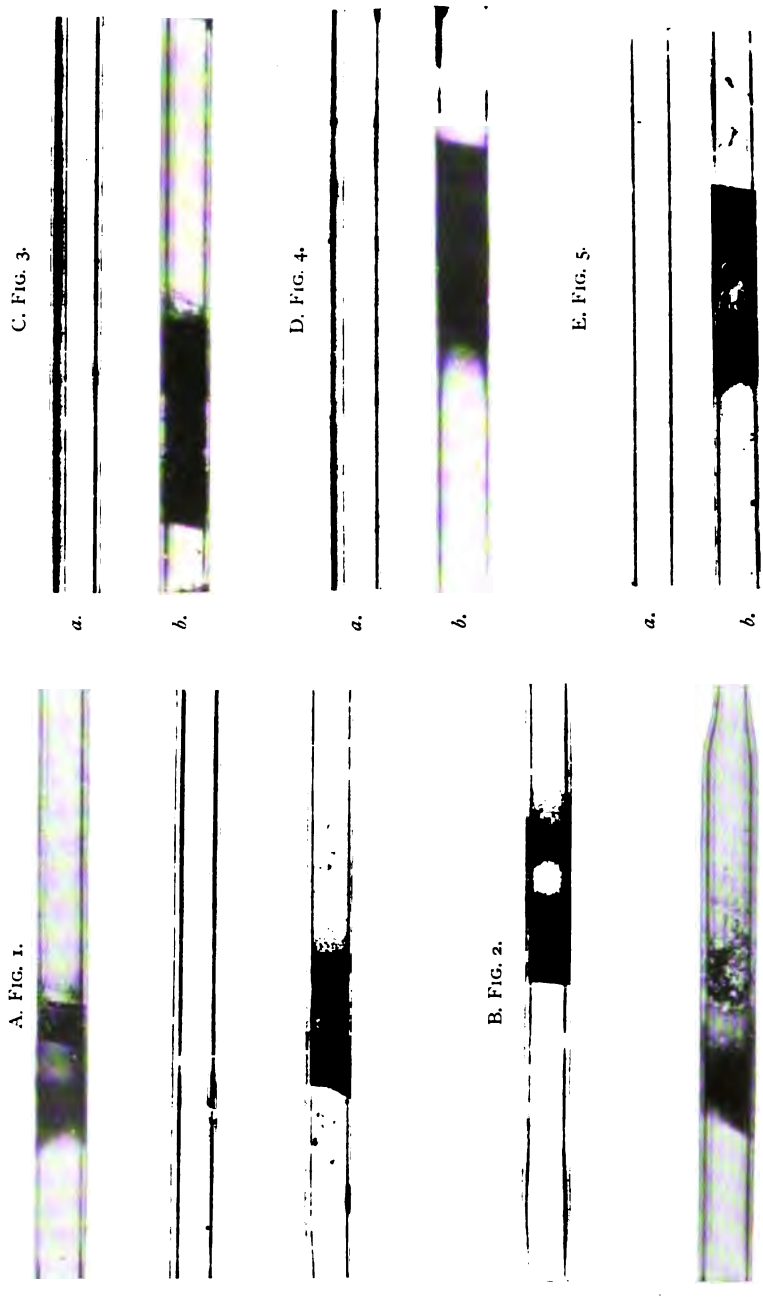


Ferric Cacodylate

It is therefore suggested that when a cacodylate is administered the arsenic remains locked up in it, in so far as its pharmacological energies are concerned. The arsenic ion thus remains inert pharmacologically, and, if so, necessarily also therapeutically; and the arsenic probably passes through the body without undergoing disassociation from methyl.

In order to obtain evidence on the last point, the urine of several of the patients who were receiving cacodylates was examined chemically in regard to the presence and form of the arsenic contained in it. The analyses were undertaken by Dr Sillar, the Senior Assistant in my department, and by Dr Waters, lately one of the Assistants, to whom I have to acknowledge my indebtedness for the care and accuracy with which the laborious chemical analyses were conducted.

It had already been shown by Armand Gautier (15) that arsenic in certain organic combinations, such as in cacodylates,



To illustrate Sir Thomas R. Fraser's Article.

cannot be isolated by Marsh's process until the organic matter has been destroyed by a very prolonged oxidation process devised by him, in which nitric and sulphuric acids are successively employed, this preliminary oxidation-process alone occupying about three hours.

Selecting a few of the many analyses that were made, in order to obtain controls, two sets of analyses (*A* and *B*) were made.

A. Figure 1.—(*a*) 27 minims of a one per cent. solution of arsenious acid = ·055 grain of arsenious acid, was mixed with 200 c.c. of normal urine, and the mixture was Marshed,[1] with the result that a well-marked arsenium film was deposited on the sublimation tube. (*b*) ·05 grain of sodium cacodylate was dissolved in 200 c.c. of normal urine (= ·77 grain of arsenium), and on Marshing the solution a very slight yellowish deposit was obtained (probably not arsenic). (*c*) A similar solution of cacodylate of sodium was first oxidised by Gautier's process and then Marshed, with the result that a dense and abundant film of arsenium was deposited.

Arsenious acid dissolved in urine, therefore, gives up its arsenic when treated with Marsh's process without any preliminary oxidation or destruction of the organic matter; whereas cacodylic acid fails to do so until its organic constituents have been destroyed by a very prolonged and elaborate process of oxidation.

B. In the following analyses, it is shown that the arsenic which is eliminated in the urine, when one of the usually administered preparations of arsenic, such as the liquor arsenicalis, has been taken by a patient, is not combined with other substances in such a way as to require oxidation of the urine before the presence of the arsenic can be revealed by Marsh's process (Figure 2).

(*a*) 200 c.c. of the urine of a patient, who had been taking liquor arsenicalis for several weeks, and was re-

[1] In all of these chemical analyses the Marshing was carried out with the modifications and details recommended by Gautier (*Annales de Chimie et Physique*, 5me Série, T. viii., 1876, p. 384). It is stated that by using these modifications of Marsh's process, the one-millionth part of a gramme of arsenic, in ordinary combinations, may be detected (*Bulletin Général de Thérapeutique*, T. 142, 1901, p. 583).

ceiving 21 minims of the liquor daily at the time when the urine was collected, was concentrated and Marshed, with the result that an abundant deposit of arsenium was formed in the sublimation tube. (*b*) Another 200 c.c. of the urine of the same day was first oxidised by Gautier's method and then Marshed, and an equally abundant deposit was formed.

The condition of the arsenic in the urine of patients receiving sodium cacodylate was ascertained in several of the cases of anæmia which have been described, two of which may be referred to, the results having been the same in all the others.

C. Figure 3.—(*a*) While one of these patients (Case 12) was receiving 12 grains of cacodylate of soda in twenty-four hours, 200 c.c. of the urine was concentrated and Marshed; but only a slight coloration was obtained in the sublimation tube. (*b*) Other 200 c.c. of the patient's urine of the same day was subjected to Gautier's oxidation process before being Marshed, and a very dense deposit of arsenium was obtained, similar to that produced when a solution of cacodylate of sodium in water or in normal urine was oxidised before being Marshed.

D. Figure 4.—(*a*) The second patient (Case 10) was receiving 9 grains of sodium cacodylate in twenty-four hours, when 200 c.c. of the urine was subjected to concentration and Marshing. The result was a hardly visible stain on the sublimation tube. (*b*) When, however, other 200 c.c. of the same urine was oxidised by Gautier's process before being Marshed, a dense film of arsenium was deposited.

In view of the uncertainties in the demonstration of a therapeutic advantage having been gained by the administration of cacodylate of sodium in the case of eczema which was previously referred to (Case 5), the results of the analyses of the urine in that case are of some interest.

E. Figure 5.—(*a*) While the patient was taking 15 grains of cacodylate of sodium in twenty-four hours (the maximal quantity administered to this patient), 200 c.c. of the urine were concentrated and Marshed, but no film or even stain was produced. (*b*) When, however, other 200 c.c of the urine of the same day was subjected to oxidation by Gautier's process and then Marshed, a very dense film of arsenium was deposited.

It is, therefore, extremely doubtful if the improvement and disappearance of the eczema in this case can be attributed to the arsenic contained in or derived from the cacodylate of soda. Bearing upon this, is the circumstance that, although reputed to be chemically pure, the cacodylate of soda administered to this patient had a distinctly alkaline reaction; and the patient was accordingly being treated with an alkali during the twenty-five days in which she received large doses of sodium cacodylate, besides being subjected to the conditions favourable to recovery that have already been mentioned.

I have not made any observations with cacodylates in pulmonary or other forms of tubercular disease, because of the great difficulty in them of instituting comparisons between the effects of different medicinal substances, and of the impossibility of arriving at trustworthy conclusions unless a very large number of cases is dealt with.

Clinical observations and chemical analyses, accordingly, agree in showing that when a salt of cacodylic acid is administered to a patient it is absorbed and is eliminated, but with the arsenic which it contains so firmly combined with the other cacodyl constituents, that it does not become disassociated, and is therefore incapable of forming any compound in the body that can produce the well-known pharmacological activities of the compounds of arsenic usually employed for therapeutic purposes.

The compounds of cacodylic acid may thus be given in massive doses, and by them arsenic may be introduced into the body in quantities which are large, and even enormous, relatively to the quantities in the commonly used compounds of arsenic, in which this element, however, is not so stably fixed as to be incapable of forming new combinations which produce well-known and powerful effects. Cacodylates may be likened to certain of the cyanogen compounds, such as the ferro- and ferri-cyanides, in which cyanogen is also so locked up, that enormous quantities may be given without causing any cyanogen action, or any manifestation of the deadly energy of hydrocyanic acid and the majority of the cyanides.

While, however, cacodylates are to be regarded as useless therapeutic agents in so far as they are compounds of arsenic, it may, finally, be observed that they are likewise inconvenient substances to administer to patients. In the cases in which

they were given by the mouth, disorders of the alimentary canal, such as nausea, vomiting and diarrhœa were often induced by them long before the maximal doses were attained, and in some cases these disagreeable effects required the administration to be suspended. Only when the administration was by subcutaneous injection, did they fail to be produced; but this is a method of administration which can rarely be continued over the long periods of time which are most usually required in the therapeutic use of arsenic preparations, while, if the subcutaneous injection of arsenic be desired, there already exists in sodium arsenate an equally non-irritating, and, at the same time, an entirely efficient arsenical preparation. Further, even by subcutaneous injection, as by mouth administration, the less important though highly obnoxious garlic-like odour of cacodylic oxide is frequently produced, and it constitutes an additional obstacle to the prolonged use of the cacodylates. These objections and inconveniences are, however, of secondary importance in view of the main result which has been arrived at, namely, that the compounds of cacodylic acid are of little or no value for producing the therapeutic effects for which arsenic is generally administered.

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2. ON THE CO-ORDINATION OF MEDICAL RESEARCH IN EDINBURGH

By D. NOËL PATON, M.D., F.R.C.P. Ed., Superintendent of the Laboratory of the Royal College of Physicians

IN the middle of last century the Edinburgh School stood *facile princeps* in medical research in Great Britain. But since then our position has been seriously assailed by various other schools, and it behoves us to consider how our leadership may be firmly established; or, to look at the question from a somewhat higher standpoint, how we may take our proper share in the advancement of medical science.

It appears to me that our position has been endangered, firstly, by the very great vitality of certain of our rivals, and secondly, by a want of sufficient scientific vitality in Edinburgh, by a tendency to live upon a past reputation. With the former we have nothing to do but to congratulate our younger rivals on their vigour, and to give them our good wishes for their further progress. We do not want them to wait for us, we desire to overtake and to outstrip them in a fair race.

Our own loss of vitality is perhaps a danger inherent in all old and successful schools. The feeling of superiority leads to laxness and to diminished effort. But it has been accentuated in Edinburgh by the absence of that invaluable commercial element in the town, the element which has done so much to make Liverpool a leading medical school, and which helped to raise Owen's College to its position. A strenuous business life undoubtedly reacts on the work of professional men.

But if we admit the loss of vitality, whether from these causes or from others as well, and if we admit that it is not easy to rejuvenesce, it is still possible that by regulating and directing the strength that is left us we may be able to hold our own among our younger brethren, and to take our fair share in the progress of medical science. It is because I believe that this is possible that I have ventured to-night to discuss the question of the co-ordination of medical research in Edinburgh.

Let us review the materials and facilities that we possess.

The medical profession may be roughly divided into:—

1. A set of older men too busy for research, but with an abundance of clinical and pathological material at their disposal.

Some of these have already engaged in research and are well able to guide the work of the less experienced. Others, as teachers, have become familiar with what we know and what we want to know, and if they are worthy of their position they should be able to suggest varied lines for investigation. Some may never have undertaken research or taught, but they too must recognise that, for the credit of the Edinburgh school, advance in medical science must be made here, and they should be only too willing to make their material available and thus to help in the general advance.

2. We have a set of younger men who have, or ought to have, time at their disposal, and who are, or ought to be, jealous of the credit of the school and eager to make their contribution to the advance of medicine. Two factors militate against their taking the part they should take in medical research: firstly, that the system of medical education in Edinburgh does not conduce to the development of the faculty for independent investigation; and secondly, because so many have to make a livelihood in practice and by teaching, and thus their time is so fully occupied that they have not leisure to devote to science. These are evils which have to be faced, but the amount of scientific work done by some of the busiest men shows what determination and energy can effect.

The facilities for medical research in Edinburgh are exceptionally good.

We have, in the first place, abundance of clinical material in the Infirmary, Children's Hospital, Chalmers' Hospital, Fever Hospital, the Poorhouse Hospitals, and the Asylums.

In the Infirmary there is an excellent post-mortem department, while various laboratories, as that of the College of Physicians, the Scottish Asylums, and the Pathological, Pharmacological, and Physiological departments of the University are available to workers, and are all more or less suitably equipped.

The excellent libraries of the Royal College of Physicians, of the Royal College of Surgeons, of the University, and of the Royal Society, are also important aids to research.

It is not for want of men who can direct work, or of men who ought to be able to do work, or of material and facilities for doing work, that we are lagging behind. To me it seems that our want of vitality has led to a want of any co-ordination

of any definite plan. A worker here and a worker there takes up and skirmishes round some small part of a subject, often in a quite amateurish way, and makes some paltry advance. But too often, for want of any co-ordination between the different parts of the school, he carries on his work on all too inadequate material, while an abundance of useful matter is going to waste in some other hospital, or even in the next ward, or from want of time he has to take up only one or two of the many questions which present themselves for solution, and thus he misses, it may be, the essential point of what he is working at. And this purely individual work, with its isolation and want of sympathy and encouragement, often wearies men. It wants a soldier of stronger *morale* to do scouting work alone than when in company with others. In the laboratory of the Royal College of Physicians I have over and over again felt the disadvantages of this individual work, and I am glad to say that I have time and again experienced the advantages of assistance and combination. I know nothing more stimulating and delightful than to share the joys and sorrows of research with fellow-workers.

This being the present condition of things, how do I propose that it should be remedied? How can we hope to get the largest amount of the best work turned out of the school? How can we, in fact, redeem the position of the Edinburgh School of Medicine?

I think a beginning might be made by having a conference of the older and younger men, and deciding upon certain subjects which should be taken up and investigated. Then the different parts or divisions of each subject would be formulated, and a group of workers formed to attack it from all available points. Everyone who might have material which would be of use would be notified, and would make it his business to supply such material. The investigation would be no longer a matter of personal interest and ambition, but would be for the interest of the whole school, and the laggard worker—and such exists—would be stimulated by his more energetic coadjutor. In carrying out the work where laboratory methods are required —and in what branch of medical science are they not now required?—all the various laboratories would be used according to their special equipments and staff, and the foolish jealousies between University and outside laboratories, and even between

laboratories in the University, would be diminished. Everyone would contribute their share in the advance—the man who provided the material, the workers who engaged upon the investigations, and the heads of the various laboratories who gave assistance and advice in the various lines of work. But I pause to ask—Is this scheme not Utopian? Is there really any chance of having it carried out? There ought to be. The material, the men, and the facilities for work are all here. But you remember Newton's first law of motion, "Every body remains in a state of rest or of uniform motion in a straight line," etc., and the question is whether or not the inertia of the present state of things is not too great to be overcome.

It is for the members of this Society to say whether in their opinion things should be allowed to go on as at present, or whether they are prepared to initiate some movement to bring about an improvement, and thus to increase the output of scientific work in Edinburgh. And I think that it would be most fitting that such a renaissance of medical science should occur under the ægis of our President, who has himself done so much to keep alight the torch of science among us.

Meeting VIII.—March 19th, 1902

PROFESSOR T. R. FRASER, M.D., LL.D., *President, in the Chair*

This was a special Clinical held in the Royal Infirmary.

I. EXHIBITION OF PATIENTS

1. *Mr F. M. Caird* exhibited—

(*a*) A girl, aged 13 years, after removal of an INTRACRANIAL TUMOUR. Four years ago she had received a blow on the left side of the head, which was followed by cramp and severe twitching of the right side of the face, the right arm and leg. The extremities were somewhat wasted; she had little power of flexion, and still less of extension of the fingers, and the thumb lay acutely flexed and could not be extended. There was a circular elevated bony area, somewhat tender, anterior to the upper extremity of the left fissure of Rolando. A disc of bone, soft and vascular, was removed from this part in November 1900. The underlying structures appeared

normal. As a result of this operation the patient experienced some temporary relief; but as vomiting and symptoms returned, the wound was reopened in February 1901, when the dura was found to be protruding and not pulsating. On incising the brain tissue, an encapsuled gliosarcoma about the size of an egg was shelled out. The patient has since progressed favourably, the twitching and vomiting have ceased, and the condition of the limbs has greatly improved.

(*b*) A woman, after partial removal of an INTRACRANIAL TUMOUR. She was admitted suffering from a swelling over the left eye and protrusion of that globe. There had been vomiting, headache and pain for five years, and her mental capacity was somewhat impaired. The swelling pulsated, was translucent and projected through the Os frontis, and was thought to be some form of cyst arising from the dura. On cutting down, several drams of clear cerebro spinal fluid were removed and a portion of a diffuse neoplasm. The patient is now apparently in perfect health. The pathologist did not feel inclined to express an opinion as to the nature of the cerebral "indefinite" tissue removed.

2. *Dr F. D. Boyd* exhibited a case of CONGENITAL SPASTIC PARAPLEGIA. The patient exhibited all the usual signs and symptoms, but the condition was complicated by an attack of basilar meningitis with hydrocephalus.

3. *Dr Allan Jamieson* exhibited—

(*a*) Case illustrating the combined features of LUPUS VULGARIS AND LUPUS ERYTHEMATOSUS on the same patch.

M. P., 17, Oldhamstocks. Fairly healthy young woman with transparent skin. On the upper part of the left cheek is a cluster of nodules arranged in an annular form, not wholly disappearing under the diascope, leaving a blurred staining in the skin, and conforming generally to the characters of lupus vulgaris in an indolent condition. In the centre is a scaly mass, about the size of a threepenny piece, the scales having the hard splintery aspect of those seen in lupus erythematosus, and on being forcibly removed showing tag-like prolongations dipping into the follicles. But a little above the lobe of the right ear is a small patch which can hardly be anything else than lupus vulgaris.

(*b*) Case of LUPUS ERYTHEMATOSUS after prolonged treatment by quinine.

This patient, a nurse by profession, first consulted me sixteen years since. She had then two well-marked patches of lupus erythematosus on each cheek, and these, though varying a little at times, being specially prominent before each period, were resistent to all the methods of treatment tried. In June 1900 there were still two patches on the cheeks the size of a crown piece, though a small portion near the eyes had cicatrised. She then commenced to take quinine by my advice, in the dose of five grains thrice a day. Up till the 27th January 1902 she had taken in all six ounces, and the lupus had steadily improved since she began, and was practically cured, a smooth fine cicatrix remaining. She found, as Unna has emphasised, that dry application suited best.

(*c*) Case of PARAKERATOSIS VARIEGATA (Unna).

J. T., aged 37, employed in gasworks, Portobello, was originally sent to me in 1897 by Dr Balfour. He had then had the complaint for a number of years. Only the covered parts of the body were affected. There is a peculiar red or crimson mottling of the skin of the trunk and limbs, made up of fine lines inclosing whiter areas. In places very minute red points are visible, scarcely elevated above the surface, and which can hardly be called papules. The skin feels dry and thinned, and desquamates a little here and there. A certain degree of itchiness is complained of at times. He was shown at the meeting of the British Medical Association in 1898, and Unna claimed him as an example of his parakeratosis variegata. Personally I was inclined to regard the condition as a variety of lichen planus. It has remained practically unaltered since then. His general health is excellent. No treatment has influenced it at all.

(*d*) Case of PITYRIASIS MACULATA ET CIRCINATA.

A. S., 40, German, baker. For three years he has had a patch of what appears seborrhœic dermatitis, or flannel rash, on the back between the scapulæ. A month ago the present rash came out on his arms and shoulders. There are pale red or pink rings inclosing paler skin, studded over the upper arms and shoulders. These are in places slightly scaly, and have all the features of pityriasis rosea or maculata of Gibert. This disease commences by a primitive or herald

patch, and spreads over the covered parts of the trunk and limbs, with all the aspect of a parasitic disease; but so far no parasite has been isolated, and it spontaneously disappears.

4. *Mr C. W. Cathcart* exhibited—

(*a*) A case of COMPLETE RUPTURE OF THE BRACHIAL PLEXUS in a lad whose arm had been much stretched by being caught between two rollers. He had all the indications of complete paralysis of the brachial plexus; he seemed, however, to have some slight action of the subclavius and serratus magnus, and had no affection of the pupil. This indicated that the roots were uninjured and encouraged operation. An incision was made in the neck but no trace of the brachial plexus could be made out, a mass of scar tissue occupying its place in the posterior triangle. The clavicle had to be cut so as to get to the nerves beyond the scar tissue and trace them back into it. One nerve trunk was found adherent to the scalenus anticus, and representing the upper ends of the plexus. In order to bring this to the nerves below the scar tissue, it had to be split and partly turned down. So far there had been no improvement, but Mr Cathcart pointed out that it might be months before improvement takes place. He contrasted this case with one of partial rupture of the plexus, viz., of the eighth cervical and first dorsal, and considered these cords too near the subclavian artery to advocate suturing. Both cases had been sent to him by Dr James.

(*b*) A case of EXCISION OF GANGRENOUS BOWEL FROM STRANGULATED HERNIA with immediate suture of the bowel, in a man aged 60.

(*c*) A case in which urgent CEREBRAL SYMPTOMS were relieved by tapping the middle fossa in fracture of the base of the skull.

(*d*) A case of BAZIN'S MALADY which was on the fair way to heal after treatment by salicylic and creasote plaster, followed by ichthyol and zinc. The ulcers had previously been scraped twice, and caustic had been applied, but without success. A bacillus, apparently specific, had been isolated by Dr Shennan from this case.

5. *Dr Byrom Bramwell* exhibited—

(*a*) A man in whom the STEREOGNOSTIC SENSE in the left hand was for a time completely lost.

(*b*) A case of BRIGHT'S DISEASE in which marked diuresis resulted from boric acid.

6. *Mr Alexis Thomson* exhibited—

(*a*) A male patient, aged 17, after suture of PENETRATING WOUND OF STOMACH.

While engaged in his work as coachbuilder he was pressing a gouge home into the brace, with the point against his body; the point passed through his clothes and entered the belly. He pulled it out himself, and then reported the occurrence to the foreman, who had him brought up in a cab to the Infirmary. He vomited some black stuff en route.

When Mr Thomson saw him in bed, a small wound was found one inch to the left of the middle line and just below the level of the umbilicus. A probe entered obliquely upwards for ¾ inch. The abdomen was tender and its respiratory movements very feeble. There was no evidence of shock.

Mr Thomson operated six hours after the accident. On opening up the wound, which passed through the left rectus, the peretonial cavity was found to be penetrated. Blood clots lay everywhere between the coils of intestine. There was no free gas or any apparent leakage of visceral contents. The bleeding was traced to the stomach, and on pulling down this organ an opening, large enough to admit the little finger, was found in the anterior wall close to the lesser curvature; a spouting artery was seen at the edge of the opening and from the opening there escaped a dark mixture of blood and gastric juice. The opening was closed by a double row of sutures, the belly washed out with saline, and a glass tube inserted into the pouch of Douglas. He vomited partially digested blood during the operation and at intervals for two days afterwards. Otherwise his recovery was uninterrupted.

(*b*) A male patient, aged 61, after operation for IRREDUCIBLE HERNIA containing a large DIVERTICULUM from the urinary bladder. He had suffered from a left inguinal hernia for twenty years; latterly it had escaped from the truss and become irreducible. The hernia was as large as a turkey's egg, and apparently contained omentum. At the operation two sacs were found to emerge from the inguinal canal, the posterior one being peritoneal, the anterior being a diverticulum from the bladder. Both sacs were removed after ligature of the neck.

The operation was followed by hæmaturia, and the wound broke down on the fifth day and discharged urine. Healing occurred after prolonged suppuration, and the patient is now (twelve months after operation) in excellent health.

7. *Dr G. A. Gibson* exhibited two cases—

(*a*) An ABERRANT CASE OF POLYNEURITIS, presenting most of the features commonly attributed to Landry's Disease. The patient had suffered from no infectious disease since childhood or from any accident except a fall on the bridge of a steamer, due, Dr Gibson thought, to the disease and not a cause of it. There was an almost complete paralysis of both lower extremities as well as of the right arm, and, to a great extent, the left also. A total loss of all reflex phenomena and of every tendon response was found, as well as a loss of tone in the muscles, which began to waste. There was no diminution in the sensibility, but some subjective disturbances, as pain on pressure. It was of great interest that there was no reaction of degeneration. Landry's Disease is now generally regarded as a form of polyneuritis, in which motor symptoms are the most prominent features of the disease. Some sensory disturbances may be present in that form ; in fact, Landry's original description contained some sensory symptoms.

(*b*) A patient with PYLORIC STENOSIS in whom pyloroplasty had been performed by Mr Cotterill. The patient was 45 years of age, and he had laboured under dyspeptic symptoms for three years. About three months previously he had suffered greatly from vomiting, and had lost weight rapidly. There was a total absence of free hydrochloric acid in the gastric secretion, as well as a great diminution of the total acidity ; no lactic acid was present. The stomach reached to one inch below the umbilicus. No peristaltic movements occurred in the gastric walls, but splashing easily took place over a wide area. Examination of the blood showed no pathological leucocytosis. The case was not one of atonic dilatation, and Dr Gibson was inclined to think that it was not a malignant contraction. Mr Cotterill found it to be a cicatricial contraction of the pyloric opening. The patient had increased nearly one stone in weight since the operation.

8. *Mr David Wallace, C.M.G.*, in Professor Cheine's

absence, exhibited three cases of JACKSONIAN EPILEPSY from Ward 13.

(*a*) H. S., aged 22, struck five years ago with heavy hammer, such as is thrown at sports. The result was an extensive compound fracture of the right frontal bone. Ever since he had suffered from epileptic convulsions. The marked feature of each convulsion was conjugate deviation of the eyes to the opposite side. A large area of bone, which was adherent to the dura mater, was removed from the skull over No. 12 area of Ferrier union, by first intention. Condition markedly improved.

(*b*) S. G., aged 11. Patient fell from horse two years before admission. Deep scalp wound, with injury to bone. A year after he suffered from epileptic convulsions, and these had recently become very frequent, often three to five fits a day. The injured area was exposed and the bone removed. No adhesion of bone to dura mater. No improvement took place in this case.

(*c*) J. D., aged 22, fell backwards off a scaffold 12 feet in height, sustained a severe compound fracture over the middle third of left Rolandic area. He was treated in the Medical House for right hemiplegia, and gradually recovered the use of his leg and arm. He was seen as an out-patient for a small ulcer of the skin over the seat of fracture. He had one day two fits, and no recurrence having taken place, an operation was not considered advisable. He was placed under the observation of his medical attendant, to return to hospital if the fits recurred.

9. *Mr J. M. Cotterill* exhibited a patient, aged 22, who, as the result of his horse being shot under him, fell and dislocated the upper end of his right radius. The bone could be dislocated and reduced at will by the patient, but it gave him a great deal of pain in use, and both flexion and extension were very limited, as was also supination.

Mr Cotterill exposed the upper end of the radius by an anterior incision, and finding the orbicular ligament entirely destroyed, he removed the head of the radius just above the bicipital tubercle. The result has been perfect, all movements of the joint being fully restored, and the patient—who is now, a month after the operation, taking boxing lessons—says it is almost as strong as ever.

10. *Dr Norman Walker* exhibited—

(*a*) A well-marked case of URTICARIA PIGMENTOSA in a boy, aged 7. It showed the well-known features of that rare disease: there were urticarial wheals and numerous persistent raised yellow patches. Most cases recovered in time, but no treatment was of any avail.

(*b*) A case of RODENT CANCER treated by arsenical paste.

He was not a great advocate of caustics, but their occasional value had been impressed on him in the case of a gentleman who was under his care last summer, and who absolutely declined operation.

In the case shown the growth was seated on the point of the nose, and a surgical operation would have involved great disfigurement. He consequently applied the modern arsenious paste, which is composed of arsenious acid, acacia and orthoform; the latter ingredient was stated to abolish the pain of the arsenic, but he did not find the patients shared this opinion. After three days' application of this, the growth sloughed out as a whole, to his great satisfaction, for he hoped to have procured a valuable and interesting pathological specimen; the arsenic, however, had had so hardening an effect on the tissues, that after breaking two razors the pathologist gave up further attempts to make sections as impossible.

There was a small recurrence no larger than a hemp seed, which he curetted and again applied the paste to. Now, five months subsequently, the disease was apparently cured, and there was hardly any disfigurement.

(*c*) A case of ICHTHYOSIS in its milder form. The history was very clear and instructive. It was usually stated that ichthyosis was a congenital disease; as a matter of fact it rarely appeared until the children were almost a year old, and in this case the circumstances permitted an unusually definite history of its appearance about that age. He was treating the case with small doses of thyroidin.

II. Exhibition of Pathological Specimen

Dr G. A. Gibson exhibited a BRAIN from which a cerebellar tumour had been removed by Mr Cotterill.

III. Demonstration

Dr Allan Jamieson demonstrated the lamp made by Messrs Marshall & Woods, London, for the light treatment of lupus. This is a simple and comparatively inexpensive apparatus, a modification of the method so successfully employed by its discoverer, Dr Finsen of Copenhagen. In the original Finsen lamp, an arc light of great power and brilliancy was and is used. This necessitated the removal of the patient to a considerable distance, in order to avoid burning, which could not be wholly prevented by the circulating current of water. It also required that the necessary pressure to blanch the part, so as to obviate the neutralising effect of the blood screen on the bactericidal property of the ultra-violet beams, be continuously exercised by a nurse. The exposure, too, was long—an hour and a quarter as a rule, and expensive, owing in part to the amount of electricity consumed, partly to the number of nurses required. MM. Lortet and Genoud have invented a smaller lamp, which only requires a voltage of about 40 and an ampérage of 10. The light in this case can be brought within an inch or two of the part, hence but little loss of intensity is sustained. A current of cold water flowing constantly between two lenses of rock crystal, keeps the outer one quite cool, and the pressure is obtained very conveniently by the patient himself against the lens. The principle is that the ultra-violet rays have a slightly longer focal length than the red or heat ones, thus the part so pressed against the lens is within the heat focus, and this is lost in the skin beyond. The length of exposure is only fifteen minutes, and in general reaction, shown by blistering within a few hours, is observed. The expense, too, is very trifling—something like a sixpence an hour or so. Already a number of patients are being submitted to the influence of the treatment, for the due carrying out of which the Managers of the Royal Infirmary have set aside a special room, as an adjunct of the Skin Department, so as to bring that branch in this respect fully up to modern requirements.

Meeting IX.—May 7th, 1902

PROFESSOR T. R. FRASER, M.D., LL.D., *President, in the Chair*

I. ELECTION OF MEMBERS

Professor Henri Huchard, Paris, was elected a Corresponding Member of the Society.

C. M. Pearson, M.B., Ch.B., 17 Alva Street, and George Halley, M.B., F.R.C.S.Ed., Dundee, were elected Ordinary Members of the Society.

II. EXHIBITION OF PATIENTS

1. *Dr Norman Walker* exhibited four cases of LUPUS treated by various methods of photo-therapy, and stated that for over two years he had been using the X-rays in the treatment of lupus. Last summer a friend mentioned to him that an electrical engineer had told him that iodine and electric light produced much greater reaction than either separately. It occurred to Dr Walker to try the effects of iodine along with the X-rays, and his clinical assistant, Dr Raeburn, expanded the idea. They selected a very extensive case of lupus of the face. Dr Walker painted one part with carbolic lotion, one with tincture of iodine, and another with liq. antimon. chlor., and then exposed the patient to the X-rays. After a short period of treatment the parts got so sore that treatment had to be suspended, and the part to which the carbolic acid had been applied became what was practically an ulcer as large as the palm of one's hand. Under treatment this healed up with an almost perfect scar; indeed the result has been the most satisfactory that he ever had in an extensive case.

Dr Walker determined to further pursue this line of treatment, and now, in suitable cases, paints the affected part with pure carbolic acid, and then exposes it to the X-rays. In a very few days there is considerable reaction; the part swells and there is often some sloughing. Under soothing treatment, however, (generally using zinc ichthyol salve muslin) the ulcer soon heals. Sometimes one application is sufficient, if the patch is small, but every case in which the method has been

used has greatly benefited, and it can be repeated until a cure results.

Dr Walker thinks this experience emphasises the fact which he dwelt upon in the discussion at Cheltenham, that treatment by the various Light methods should invariably be carried out under the directions of one who is familiar with the diseases which are being treated, and also that it is not wise to limit treatment to these at present fashionable methods.

2. *Mr Alexis Thomson* exhibited a patient after a COSMETIC OPERATION FOR HYPEROSTOSIS of the left upper jaw and malar bone. The patient was a young woman, aged 27. The enlargement of the cheek had existed since ever she could remember, but had been increasing during the last ten years. There was no complaint except of the deformity. The soft parts were normal. The hyperostosis affected the entire upper jaw except its orbital margin. The downward projection of the alveolar margin caused obliquity of the oral fissure. The overgrowth of the nasal process was associated with deviation of the nose to the opposite side. The condition was believed to be of congenital origin. On the 26th March 1902 Mr Thomson reflected the cheek outwards and downwards, and pared away the superfluous bone with the chisel. The bone was soft like young callus. The microscopical appearances were those of active formation of bone in a vascular and cellular fibrous tissue, such as is normally observed in the periostium.

The deformity was markedly improved by the operation, but the patient was to remain under observation.

3. *Dr P. M'Bride* exhibited a patient—a young woman—who came to him some time since, complaining of deformity of the nose. At that time there was no bridge visible, and the deformity was very marked. (Photographs of the patient before treatment were shown.) Now the patient presented a very tolerable nose. This result was arrived at by using Gersuny's method of injecting paraffin under the skin. This, as all the surgeons present knew, had been employed not only for nasal deformity but for other conditions. It consisted of the injection of paraffin having a melting point of 104° F. The technical difficulties really were comprised in retaining

the syringe, and more particularly the needle, at the heat necessary to keep the paraffin fluid. The liquid was then injected under the skin where the bridge of the nose ought to be, pressure being made on the sides to prevent the fluid running into the loose cellular tissue of the eyelids. As the fluid was injected it could be moulded to any desired shape. In this particular case virtually no reaction occurred. Dr M'Bride also stated that a modification had been suggested by Eckstein, who employed paraffin with a melting point of 60° C.

4. *Mr H. J. Stiles* exhibited—

(*a*) A boy, aged 6 years, after operation for a large INTRA-DURAL ABSCESS following middle-ear disease. The patient was admitted to the Royal Edinburgh Hospital for Sick Children four weeks ago, with a discharging sinus in the right fronto-parietal region, 1½ inches from the middle line. A probe introduced into the sinus was found to pass through the bone, and to extend downwards and forwards as far as the floor of the anterior fossa of the skull.

There was no discharge from the ear, but the tympanic membrane was destroyed, and an examination of the eyes, by Dr Argyll Robertson, revealed post-inflammatory atrophy of both discs, with complete blindness of the right eye. Speech and mental perception were very slow. There was no facial paralysis, but the grip of the left hand was feeble as compared with the right. The history was, that in the end of November of last year (5½ months ago) the patient suffered from an attack of acute right-sided middle-ear suppuration, which was followed, three months later, by a general convulsion and paralysis of the (opposite) left side of the face and the left arm. The paralysis gradually improved. Seven weeks ago an abscess, which had suddenly appeared towards the upper part of the scalp on the right side, was opened by Dr Robert Robertson, who, on finding the bone perforated, recommended the patient to the Hospital.

At the operation, which Mr Stiles performed four weeks ago, after excising the sinus and granulating area of the scalp, a flap was turned down, exposing a small perforation in the bone opposite the coronal suture. A circle of bone was removed and a corresponding opening in the dura discovered;

on dilating this with sinus forceps a quantity of pus escaped. The dura was then incised, and, on introducing the finger, a large cavity, containing three or four ounces of pus, was discovered between the dura and the brain.

The drain was removed a few days ago, and the sinus is now practically closed. There is already a considerable improvement in the mental and general condition, and the grip of the left hand is much stronger. The case is of interest, as illustrating a rare sequela to a complication of middle-ear disease, viz., the pointing of a localised suppurative leptomeningitis through the coronal suture. The pus gave a pure culture of the streptococcus pyogenes.

(*b*) A child, aged 3½ years, after reduction, fifteen months ago, of A CONGENITAL DISLOCATION OF THE RIGHT HIP, by Lorenz's method. After reduction the limb was put up in plaster in the hyper-abducted position for two months; the abduction was then reduced, the plaster reapplied, and the patient allowed to go about with crutches and a high boot on the sound side, so as to throw the weight of the trunk on to the affected side, and hence to press the head firmly against, and so gradually deepen, the shallow acetabulum.

The subsequent steps in the treatment consisted in the further reduction of the abduction and the lessening of the height of the boot.

For the last three months the patient had been going about without either plaster or high boot.

Mr Stiles emphasised the importance of diagnosing congenital dislocation of the hip in early childhood, since at this age the dislocation can almost invariably be reduced by the bloodless method, and he thought the present case would convince the members of the excellent result which can be obtained by Lorenz's method. The patient exhibited was no longer lame; the trochanter was at its normal level, and no longer ascended when the weight was borne upon the limb; the head of the femur could be distinctly felt at the base of scarpa's triangle; abduction was no longer limited, and adduction could not be carried further than on the sound side. The only abnormality that could be detected was that the muscles of the limb, as a whole, were rather less developed than on the sound side.

The skiagrams, taken by Dr Rainy, illustrated, in an admirable manner, the position of the head of the femur (1)

before reduction, (2) after reduction, with the limb hyper-abducted, and (3) after the treatment was completed.

5. *Dr W. G. Sym* exhibited a girl, aged 18, who suffered from SPASMODIC CONTRACTION OF THE RIGHT INFERIOR RECTUS MUSCLE. This gave double vision to the right side and below, the lower image belonging to the left eye. The case had been diagnosed by another surgeon as paralysis of the left superior oblique, but more thorough examination showed that there was no failure in movement on the part of the left eye. Whenever the patient looked a little beyond the middle line to the right side, the right eye at the same time descended rapidly, almost suddenly, and continued to descend as the eye was moved further to the right. This occurred whether the patient looked along the horizontal plane to the right, upwards to the right, or downwards to the right, but much more during the last of these movements. It was difficult to explain the condition on the theory of a faulty attachment either of the inferior rectus or one of its opponents, for the displacement occurred when the inferior rectus was not at all called upon to act. Dr Sym suggested that the cause might be the distribution of some of the nerve fibres to the inferior rectus, which really belonged to the external; the former muscle would thus be brought into action whenever the latter was powerfully innervated. A somewhat analogous condition sometimes occurred in connection with pupil fibres travelling in the sixth nerve. He confessed, however, that on this theory he was at a loss to account for the *recent* development of diplopia.

6. *Mr J. M. Cotterill* exhibited—

(*a*) A female patient whose breast he had removed two years ago, when she was 26½ years of age.

The right breast was removed and the right axilla cleared out in July 1900.

The disease returned, and in July 1901 Mr Cotterill performed oöphorectomy, as the disease had returned not only in the scar of the previous operation, but also in the other breast, while several nodules of disease were scattered over the chest, and the glands were affected in the left axilla and in both supraclavicular regions.

The result of the oöphorectomy was marked improvement in every respect for four months, the nodules in the skin

becoming considerably less in size. After four months the patient began to menstruate again, and at the same time rapid growth was noticed to occur in the tumours. The patient was accordingly put under treatment by the X-rays at the hands of Dr Dawson Turner. The result upon the nodules was very marked, several lumps from the size of a pea to that of a hazel nut entirely disappearing. The ultra-violet rays had also been used, and apparently with good effect.

Though the local effect of the X-ray treatment was very marked, new nodules of disease had now appeared over the back, neck and scalp. It was proposed to attack these with the rays also, and to report progress at a later date.

(*b*) A boy, aged 6, who some two months ago had been suddenly attacked by synovitis in both knees and both elbows.

While the disease had now some of the characteristics of tuberculous disease, the sudden onset was perhaps more suggestive of syphilis, and Mr Cotterill said he would be glad of the opinion of any members present on the case.

7. *Dr Alexander Bruce* exhibited—

(*a*) Three cases of paralysis and spasm of ocular muscles.

(*b*) Two cases of spastic paralysis following hooping cough.

III. Exhibition of Pathological Specimen

Drs H. Melville Dunlop and *Stuart M'Donald* exhibited LIVER FROM A CASE OF CONGENITAL OBLITERATION OF THE BILE DUCTS.

Abstract of clinical history.

Child, æt. 4½ months. Jaundiced from birth, the colour varying, sometimes very deep, at other times much lighter. Breast-fed and throve well till four months old, when weight was 10 lbs. No vomiting and no diarrhœa. Motions always white and urine deeply bile-stained. Liver extended 2½ fingers-breadth below costal margin. Spleen easily palpable. Skin and mucous membranes deeply jaundiced. Neither tears nor saliva gave evidence of bile pigment. When 4½ months old vomiting and diarrhœa set in, the temperature rose to 102° F., and the child rapidly emaciated and died from exhaustion.

At the sectio the liver was enlarged and firm. The capsule was smooth, and on section the colour was dark

olive green, just as at present. There was obvious increase of connective tissue along the portal tracts, the white fibrous strands showing prominently against the dark green background. The gall-bladder was small and contracted, and the cavity partially obliterated. The cystic duct was obliterated. The hepatic ducts are present, but the common bile duct is represented by a few fibrous strands at its duodenal end. Its upper end is represented by a fibrous cord. The duodenal opening was present, and a cul-de-sac led towards the pancreas.

IV. Exhibition of Instrument

Mr C. W. Cathcart exhibited a PORTABLE STEEL STRETCHER, adaptable for operating in the Trendelenburg position. He had devised it in order that the advantages of this position might be obtained in private practice, especially in emergency cases. The stretcher could be used in the ordinary way to carry the patient from one room to another, or for any other purpose. All that was required to adapt it to the Trendelenburg position was to turn forward a claw on each side attached to a central joint. When the middle of the stretcher was then bent up, the claw slipped into notches cut for the purpose and prevented the stretcher from becoming straight again till the claw was released. When the ends were placed on chairs, the stretcher in the bent position was at the most convenient height for operating in the Trendelenburg position.

The stretcher could be readily taken down and carried in a bag about the size of a cricket bag.

V. Original Communications

1. GASTRO-JEJUNOSTOMY

Twenty-one Consecutive Cases performed for Intrinsic Pyloric Stenosis

By F. M. Caird, F.R.C.S.Ed., Senior Assistant Surgeon, Royal Infirmary, Edinburgh

SINCE Wölfler first performed gastro-enterostomy in 1881 for a case of inoperable obstructive carcinoma of the pylorus, this valuable operation has been variously modified and its field of usefulness greatly extended.

The anastomosis is generally either anterior (Wölfler), the intestine being lifted over the transverse colon; or posterior (von Hacker), when it is carried through the transverse mesocolon. In any case, the loop of intestine may be so adjusted as to permit of the stomach contents passing directly onwards with the peristaltic wave (isoperistaltic), or in a direction opposite to the normal current (antiperistaltic).

The conditions calling for gastro-enterostomy may advantageously be compared with those which require gastrostomy for œsophageal stricture. The patient complains of increasing difficulty in disposing of solid food, relies more and more on fluids, and yet is badly nourished. Progressive emaciation advances, and the temperature tends to be subnormal. Moreover, the pronounced anæmia, the vomiting of undigested food, and the presence of a pyloric tumour, indicate that the risk of postponing interference is very great.

Cases of malignant stenosis are likely to receive only palliation by gastro-enterostomy. We may anticipate some prolongation of life, alleviation of pain, and the avoidance of death from starvation, results, indeed, similar to those which we gain after gastrostomy for stricture. But the rapid improvement in health, and the gain in weight which immediately follow the operation are so extraordinary, that false hopes as to the future are frequently raised.

In cases of simple stenosis, on the other hand, the relief by gastro-enterostomy may be permanent, the patient's life is saved, and the original cause of the obstruction may disappear.

The difficulty of diagnosis as to the nature of pyloric obstruction is greater than one might expect. An absolute indication of malignant disease is obtained on microscopic examination of a piece of tissue found in the vomit, and this must be a rare event. As a rule, in addition to the presence of a palpable tumour and increasing emaciation, we have to rely upon the well-known associated conditions ascertained after the administration of a test meal. These are the absence of free hydrochloric acid, the presence of lactic acid, certain bacilli, and also undigested food. Such guides may, however, fail us; they are by no means constant evidences, nor can they always be ascertained. Free hydrochloric acid may be present in malignant cases, its absence is more suggestive. There are many apparently simple tumours which exactly simulate

carcinoma, are indistinguishable by palpation through the abdominal wall, and even on inspection and handling at a laparotomy, cannot be identified.

It has to be kept in mind that patients suffering from malignant disease of the stomach are susceptible of great improvement under suitable diet and lavage, and that such a gain does not negative the diagnosis. The disease may still be advancing, and therefore it is well in doubtful cases to have resort to an early exploratory operation, when the condition encountered may be dealt with as required.

Prior to opening the abdomen, it is customary to prepare the patient by careful diet and the use of laxatives, so that the intestinal canal may be fairly empty. In gastric cases, the stomach is also washed out thoroughly on the morning of operation.

Such care, judicious enough in simple cases when the patient is not greatly reduced, may be harmful in weak subjects and in those suffering from carcinoma, where it implies the loss of valuable time and strength without corresponding benefit. No farther preparation than an enema and abstinence from breakfast on the morning of operation is advisable in such cases. Although we would gladly welcome a clean and empty stomach, lavage should only be employed if the patient is fairly strong or has been accustomed to this, as it is liable to cause syncope or dangerous prostration.

The extent and nature of the disease implicating the pylorus is ascertained on opening the abdomen in the middle line, as also the condition of the liver and of the lymphatic glands along the curvatures and in the omentum. Should radical measures be impossible, a suitable site is now selected to form a gastro-enterostomy, or rather gastro-jejunostomy. If the stomach can be lifted up with ease, we prefer the posterior aspect; but when this is difficult of access, the anterior may be chosen. Even when the stomach wall is greatly infiltrated, it is generally possible to find a sufficiently free area.

The presence of ascites and œdema of the gastric walls, together with general infiltration, may contra-indicate operation, since the stitches then are apt to cut their way out, and so much time is consumed that the patient's remaining energies may be too severely taxed. The posterior route possesses

many advantages. Thus, on raising the colon and stomach, we may at once see the origin of the jejunum as it emerges from the duodenal fold of peritoneum. We can also recognise it by its relatively thick muscular walls, and trace it upwards.

Our anastomosis should be made at as short a distance from the pylorus as convenient. The assistant, by raising the stomach and colon with one hand, and pressing on its anterior wall with the other, projects the posterior wall against the transverse mesocolon. The surgeon then lacerates the mesocolon over the projected greater curvature of the stomach, and having packed with sterile gauze, lays the loop of jejunum which he has selected against the exposed gastric wall. He now adjusts the intestine, taking care that it lies easily, contriving to arrange for an isoperistaltic anastomosis. Should this require an undue rotation or twisting of the gut, an antiperistaltic anastomosis would be more suitable, and seems to give an equally good result. The stomach and intestine are now united by a continuous Lembert suture, the lumen of each is then completely opened. The pressure of the supporting hand of the assistant is usually sufficient to prevent any escape from the stomach, and the slight danger of contamination is obviated by swabbing, and the protection afforded by the sterile gauze on which the coil rests. We are inclined to deprecate the use of clamps as unnecessary. We have usually made a longitudinal incision in the stomach; that in the intestine has been longitudinal, transverse, or even slightly oblique, according to convenience, without affecting the result. The posterior half of the union is then completed by a continuous suture, uniting all the coats at their free margin. The aperture in the stomach is now enlarged by cutting a small semilune from off the anterior lip of the incision already made. At the mid-point of this a temporary suture is carried through all the coats, and through the corresponding part of the intestine. As it is pulled upon, the gastric and intestinal margins become parallel, and it is an easy matter to unite with a continuous suture all the coats. Next follows a continuous Lembert suture, and one or two extra stitches may now be introduced at weak points and elsewhere, as required, to ensure the proper lie of the jejunum, and to prevent kinking. The lacerated retracted margins of the mesocolon are tacked to the stomach. The parts which have been exposed are finally

sponged with warm salt solution, and are carefully replaced, and the abdomen is closed.

Chloroform has been always employed as the anæsthetic.

The after-treatment during the next few days is of great moment. For the first few days rectal alimentation is given, but if the patient be very well, hot water and milk may be given by mouth the night of the operation. Pain and restlessness are combated by hypodermic injection of morphine. If the patient suffer from eructations of wind, a tendency to sickness and vomiting, and persistently bring up mouthfuls of fluid, great benefit is obtained by washing out the stomach. One has only to glance at the history of cases to recognise how frequently patients give themselves great relief by provoking the act of vomiting, and it is well after operation to get rid of the accumulation of secretion poured forth from a congested stomach, more especially when this is complicated by the presence of a septic, ulcerated neoplasm. If the patient be unaccustomed to the stomach tube, it should be used with great caution, as already indicated.

If the pulse have quickened, and does not respond to washing out,—which is always of the greatest value, and may be repeated if necessary,—30 oz. of sterile salt solution may be transferred into the veins. If this be not followed by permanent relief, the prognosis is bad, sepsis has probably occurred.

Leading features of 15 male and 6 female cases may now be considered. The posterior operation was carried out 13 times, the anterior 8 times; 14 were antiperistaltic, 7 were isoperistaltic.

1. Mr A. M., æt. 51. Carcinoma. Oct. 1895.—Began to suffer from indigestion. Sickness and vomiting after food, followed by intensely acid eructations. Has had to adopt a milk diet. Lavage tried for a month with no relief. Has lost 2 stones in weight during the last 8 weeks. There is great constipation. The patient has been a heavy drinker. He has general abdominal pain, relieved by flexing the limbs, and inducing vomiting. The abdomen is distended. There is a feeling of resistance and tenderness on palpation to the right of the middle line. Stomach dilated. Splashing. Liver enlarged. Hydrochloric acid present.

Anterior antiperistaltic gastro-jejunostomy. 24th August 1896.—A large, firm irregular pyloric carcinoma, with enlargement of lymphatic glands discovered. Patient did well, and was lost sight of till he again appeared in July 1898 feeling strong and well, his constipation having ceased. He complained, however, of a slight ventral hernia at the upper part of the incision. To cure this the abdomen was opened and not a trace of tumour or of enlarged glands could be detected. Patient left in good health and cannot now be traced.

2. Mr G. S., æt. 58. Pyloric carcinoma. Severe gastric pain, aggravated by food. Ill fifteen months. Much wasted. Lost 4½ stones since last year. Distended, tender, resistant abdomen. Spleen enlarged.

Anterior, antiperistaltic gastro-enterostomy. 25th September 1896.—Large infiltrating pyloric mass found. Patient survived only twenty days. The sectio revealed extension to and invasion of the spleen with perforation at the cardiac end of the stomach.

3. Mrs. R., æt. 71. Gastric symptoms for eighteen months. Appearance of a large mass fixed to umbilical region. Emaciation, vomiting. Patient was about to die of starvation.

Anterior antiperistaltic gastro-jejunostomy. 27th May 1900.—The operation presented many difficulties, but an anastomosis was effected and gave relief by alleviating the distressing vomiting. Patient died 22nd June 1900.

4. Mrs L., æt. 68. Carcinoma. Ailment began in spring of 1899 with epigastric pain after taking food. This increased in duration and intensity. Vomiting after meals. Finally, only fluids could be taken. Much troubled with constipation. Pain worse when lying on the back or the right side. Oval swelling palpable, size of a duck's egg, lying transversely across epigastric region, moving with respiration. Glands in right groin much enlarged and hard. Weighs 7 st. 2¼ lb. Formerly stout, has lost 5 stones. Hydrochloric acid diminished. Father died, æt. 66, of "tumour in the stomach." Had pain and vomiting. Mother died, æt. 77, of obstruction. A twin brother said to have died of "tumour in the stomach."

Anterior antiperistaltic gastro-jejunostomy. 14th December 1900. — Large tumour of pylorus and lesser curvature. Glands in omentum. Patient was on full ordinary diet and left hospital on 6th January. She reported herself on 16th January; was in good health, all her discomfort had gone, she could eat anything, and weighed 7 st. 7 lb. No tumour could be palpated. Since this date she has been lost sight of.

5. Mr J. M'L., æt. 44. Carcinoma. Ill sixteen months. At first pain and flatulence three hours after meals. Vomiting came on three months ago, and increased until he could not retain any solid food. Constipated. Hard irregular mass felt in the epigastrium, which moves with respiration. No free hydrochloric acid. Weight, 8 st. 10 lb. July 1899 was 11½ st.

Anterior antiperistaltic gastro-jejunostomy. 22nd December 1900.—Good recovery. Patient left hospital 16th January, weighing 8 st. 13 lb. The patient returned looking much better, and it was resolved to explore with a view to a radical operation, when general peritoneal infection was discovered. The patient progressed well, however, and was about to leave for home, when he suddenly fell back dead from cardiac syncope.

6. Mr A. G., æt. 48. Carcinoma. About three years ago symptoms of dyspepsia came on, pain, distension, and slight vomiting two or three hours after food. In July much worse. Lavage used with some benefit, but increasing trouble and loss of weight has occurred since October. Abdomen much distended. Peristaltic waves seen passing towards pylorus, where there is a large resistant area. Stomach 1 inch below pylorus. Hydrochloric acid present in small amount. Weighed 11 st. in June 1900; at present only 6 st. 7 lb.

Anterior antiperistaltic gastro-jejunostomy. 26th December 1900. — Large mobile tumour, not so hard as usual, extending into stomach. Gastric walls very thick and vascular. Small intestine very vascular. No enlarged glands. Some gastric and intestinal contents escaped during operation. Good recovery. Left hospital 14th January weighing 6 st. 11½ lb. Is at present strong and well and scales over 10 st. No tumour can be felt.

7. Mr Z., æt. 63. Carcinoma. A big-boned, tall man, much wasted, weighs only 7 st. Has suffered from dyspepsia for two years and can only retain a little milk. Suffers great pain after food. There is a large mobile pyloric tumour.

Anterior antiperistaltic gastro-jejunostomy. 27th December 1900.—No sickness, but pulse rose to 120, and he was washed out on 30th and 31st. Soft boiled egg and chicken tea given next day. Patient very intractable and difficult to manage. On the couch, 3rd January. Required bromide and nepenthe for some time. Eventually made a good recovery. In July 1901 he returned, weighing 9 st. 8½ lb., very hypochondriacal, and complaining of three nodules which lay in the cicatrix. These were excised and the abdomen again opened. The tumour had almost entirely disappeared. The nodules showed carcinomatous alveoli, with excessive fibrous matrix. Patient now in an asylum.

8. Mr D. M., æt. 35. Innocent inflammatory tumour of pylorus, with adhesions due to gastric ulcer. Patient a tall, strongly-built, but pale and thin miner; addicted to alcohol. Has complained of pain after food and by night, vomiting and hæmatemesis for the last four years. For this he has been frequently treated. A tumour is felt just below the tip of the ensiform cartilage, but the area is too tender to permit of careful palpation. It moves with respiration, descending from under cover of the ensiform. Stomach not dilated. Weighs 9 st.

Posterior antiperistaltic gastro-jejunostomy. 28th December 1900.—There was a pyloric tumour the size of a golf ball, of a wooden rather than stony hardness, and a dense mass of adhesions stretched from the liver to the lesser curvature. One large gland on the greater curvature. Progress good. Weighs 8 st. 8 lb., 10th January 1901. On 12th February 1901 weighed 11 st. 3 lb.; looks and feels well. Can eat anything. Pain gone. No trace of tumour can be felt. At present enjoys good health.

9. Mr J. A., æt. 64. Carcinoma. A healthy and temperate man, began to complain four months ago of pain in the stomach, which was at first relieved, but latterly aggravated on taking food. About an hour after meals pain felt below xiphisternum

and a little to the left. No vomiting. Marked constipation. Has been getting thinner. Weighs 8 st. 9½ lb. A tumour the size of a walnut can be felt 1½ in. below the xiphisternum to the left of the mid line; it moves with respiration and is slightly tender. Leading from it to the left costal margin is an indefinite resistance. Hydrochloric acid, a mere trace. Atheromatous vessels.

Posterior antiperistaltic gastro-jejunostomy. 3rd February 1901.—A large tumour found, hard, affecting the pyloric third of the stomach, both anterior and posterior walls, and running up along the larger curvature. Numerous enlarged glands. Stomach small and rather contracted. The patient vomited some blood after the operation, and this continued on the following day, when he passed flatus and so was not washed out. The abdominal wound became septic and he suffered from diarrhœa, and was not out of bed till 2nd March, when he weighed 7 st. 6 lb. When last seen on 14th March he was progressing favourably, and weighed 7 st. 9¼ lb.

10. Mrs M. R., æt 34. Carcinoma. Previously healthy, she had a sudden attack of coffee-ground vomiting four months ago, with pain and tenderness. This passed off under rest in bed and treatment, but she has lost flesh since, is anæmic and suffers from increasing weakness. There is constant gastric pain intensified after meals; the stomach becomes swollen an hour after food. She weighs 5 st. 9½ lb. A tender, rounded, mobile mass about 3½ in. in diameter can be palpated in the epigastric and umbilical regions, its lower edge ¼ in. above the navel.

Posterior antiperistaltic gastro-jejunostomy. 10th April 1901.—Stomach washed out prior to operation. Tumour chiefly involved posterior aspect of stomach and did not quite reach the pylorus. A chain of infected glands passed along the lesser curvature to the œsophagus. On the morning after the operation the patient had pain, sickness and vomiting. The stomach was washed out at 11 A.M., and the patient thereafter did well.

11. Mr D. F., æt. 66. Carcinoma. About two and a half months ago food began to lie heavy on his stomach, and pain came on fifteen minutes after eating. He lost appetite and only took milk. There has been no vomiting or nausea, but

a bad taste in the mouth annoys him. Much constipation. Formerly he weighed 14 stone, now only 11½. No free hydrochloric acid. No definite tumour found, but there is tenderness and tension of the abdomen to the right of the epigastric region extending into the right hypochondrium.

Posterior antiperistaltic gastro-jejunostomy. 29th May 1901. —Large tumour present, not completely occluding pylorus, with extensive glandular infection. Serous and muscular coats very friable and union effected with difficulty. Patient slept well after operation, had a pipe and wrote a few words to his wife. On the 30th he was troubled with vomiting, which distressed him again on the following day. As the pulse remained steady, about 104, and temperature normal, he had calomel and an enema, thereupon he had a stool and passed flatus. On 1st June peptonised milk was given; he slept a great deal but still vomited at intervals. On 2nd June vomiting still persisted, and he was washed out, getting great relief and bearing the operation well. His pulse fell below 100. Vomiting returned in the evening and he was again washed out, and he passed a good night free from sickness. 3rd June he slept most of the day. Vomiting again recurred with a fæcal odour, but he slept well, having had ¼ grain morphia. On the 4th June he suddenly collapsed, was transfused, and in the belief that a circulus vitiosus might have become established the abdomen was again opened under cocaine, but everything was found normal. After a slight rally he began to sink and expired on the 5th at 10 P.M., a week after operation.

At the sectio there was found broncho-pneumonia of both lungs; liver fatty with two secondary nodules. Infected glands lay along the spine, and one, softening, to the right of the upper part of the trachea. Kidneys congested. No peritonitis.

12. Mr W. R., æt. 52. Carcinoma. His father, mother, and their family (ten) all suffered from stomach ailment. Patient of alcoholic habit, suffered from dyspepsia, vomiting and water-brash twelve years ago. He vomited blood eight years ago and two years ago. Since January 1901 has been getting worse and has lost one and a half stone. Pain comes on immediately after a meal, is most constant in the epigastrium, is worst at night and is relieved by vomiting. Is very constipated. No free hydrochloric acid. No palpable tumour.

Posterior antiperistaltic gastro-jejunostomy. 3rd June 1901.—A capacious, thin-walled stomach with a carcinomatous tumour of pylorus extending to the lesser curvature. Infected glands on the lesser and greater curvature and scattered throughout the omentum. The patient did well, being troubled with flatulence relieved by sitting up in bed, and having a motion on the 6th and 8th. On the morning of the 9th he became restless and began to bring up mouthfuls of dark greenish fluid at considerable intervals, and was again relieved by being propped up in bed. At 1 P.M. he began to collapse, had cold extremities and 30 oz. saline solution were transfused. He rallied for a short time and then rapidly sank, dying at 8 A.M. on 10th June.

Sectio.—The gastro-enterostomy wound was perfect. A layer of pus lay between the parietal peritoneum and the anterior aspect of the omentum and small intestine. This localised peritonitis did not extend to the pelvis or elsewhere. Brown atrophy of heart. Emphysema and œdema of bases of the lungs.

13. Mrs D., æt. 30. Carcinoma. Dilated stomach. Was in service in 1890 where she had bad and insufficient food. Pain after meals and interscapular pain then developed. She has been dyspeptic ever since. In 1894 the pain was associated with vomiting which gave her relief. In 1898 hæmatemesis came on and another attack in the following year. She was fairly well till March and April 1901. Recently pain has become constant and hæmatemesis and vomiting have returned. The patient is greatly emaciated, weighs 7 st. 10½ lb. There is well-marked peristalsis of the stomach, no palpable tumour, but marked tenderness over an area from the ensiform cartilage downwards for 2½ inches, and 1 inch transversely. The lower border of the stomach lies 2½ inches below the umbilicus.

Posterior antiperistaltic gastro-jejunostomy. 31st July 1901.—There was found a hard wooden-like constricting area about two fingers' breadth encircling the stomach about 3 inches from the pylorus, which would not admit the little finger invaginating the stomach wall. Some enlarged but soft glands were found in the omentum.

Patient did well, was fed with milk on the night of the

operation. Weighed 9 st. 2¼ lb. in August and was the picture of health when last seen in December 1901.

14. Mr T. M., æt. 39. Carcinoma. In August 1900, pain after food referred to lower end of sternum, and later to left costal margin in mammary line. He was also troubled with flatulence and constipation. In January 1901 the gastric pain after food was almost always present. He suffered from cold extremities. About end of June he began to vomit every two or three days, and in four weeks more, at night also. This relieved him. No hæmatemesis. Formerly he weighed 10 st. 7 lb., now 8 st. No free hydrochloric acid. Mobile palpable tumour sometimes felt in pyloric region. Stomach dilated to below umbilicus. Posterior isoperistaltic gastro-jejunostomy. 17th August 1901.—Much free fluid escaped from peritoneal cavity. Large malignant tumour of pylorus found with many enlarged glands. Very vascular mesocolon. At end of operation (one hour) pulse dropped to 36, very weak. Restored by hypodermic of strychnine and administration of salines by rectum. Further progress satisfactory although badly troubled with cough, expectoration and swollen feet. Left for Medical home on September 11th. On November 6th very well, weighs 9 st. 7 lb. No tumour to be felt. Patient had no further gastric trouble, but died of phthisis pulmonalis, 10th December 1901. Sectio refused.

15. Mrs J. M., æt. 52. Carcinoma. A sallow, emaciated woman. Pain came on gradually in the right side about Christmas 1900. In a fortnight acute attacks ensued, followed and relieved by vomiting. Pain is now continuous with exacerbations; vomiting and sickness occur at intervals of two or fourteen days. She became paler and thinner. Formerly she weighed 12 st., five weeks ago 10 st. 7¾ lb., now 9 st. 8 lb. There is a small nodular mobile tumour in the epigastric region. Stomach extends 1 inch above umbilicus. There is slight œdema of skin between ensiform cartilage and umbilicus. No free acid in vomit. Blood corpuscles, food, debris and nucleated round cells present. One brother died æt. 35 of "ulcerated stomach."

Posterior isoperistaltic gastro-jejunostomy. 31st August

1901.—A hard, almost stone-like mass occupied the pyloric third of the stomach ceasing an inch short of the pylorus.

The patient was sick and restless after the operation with a rapid pulse, and received saline fluid per rectum, brandy and tincture of strophanthus. On the following morning the pulse still ran between 120 and 130. She was washed out, and sickness ceased till 8.30 P.M., and milk was retained. The pulse still rose, and patient expired at 7 P.M., 3rd Sept. T. 100·3. Sectio revealed a fungating carcinoma. Not a trace of peritonitis, wound perfect.

16. Mr S., æt. 50. Illness began six or seven months ago with loss of appetite, flatulence, water-brash, and loss of weight. He has lost 5 st. in six months. No vomiting till two weeks ago; almost daily an hour or so after meals; not a large quantity. Coffee-ground-like on more than one occasion. Has lived on slops lately, and can only take a few mouthfuls at a time, whereupon the stomach feels full. No pain. Slight fulness and resistance in epigastric region below left costal margin. Marked tenderness on deep palpation below umbilicus. No free hydrochloric acid. Bowels constipated.

Posterior isoperistaltic gastro-jejunostomy. 19th Nov. 1901. —Carcinoma of pylorus and body of stomach. Nodules in omentum. Anastomosis effected with some difficulty from wide extent of disease and fixation of organ. Patient rapidly improved. Within a week was eating hare soup. Vomiting ceased. Patient began to fail in February, and died in March 1902.

17. Mr J. G., æt. 50. Carcinoma. Jaundice and indigestion developed as the result of a chill in April 1901. Dyspepsia continued, and the patient suffered from swelling after food, but no pain or nausea. He sometimes brought up mouthfuls of food at times, two hours after food, and induced vomiting himself, as he thereby gained relief. Appetite good, often voracious. A tumour was detected, and during October he was treated in the medical wards, where he gained 4 lb. and greatly improved. There has been no vomiting for the past five weeks. He is an emaciated man with a trace of jaundice; weighs 8 st. 7 lb. A rounded firm swelling moving with respiration can be felt 1¾ inches above the umbilicus and

1¾ inches to the right of the middle line, tender at one spot on deep pressure only. Stomach 2 inches below umbilicus.

Posterior isoperistaltic gastro-jejunostomy. 2nd November 1901.—Pylorus involved in a mass of carcinoma, and a second rounded mass extending from it to the liver. Glands also involved. Did not sleep after operation; had continuous pain and flatulence. Vomited at 2 and 9 A.M., a brownish, bilious, odourless fluid. Vomited at 8 P.M. Pulse rose to 128. Washed out at midnight. 4th.—No more vomiting or sickness. Pulse still rapid, 120. T. 99·8. Afternoon pulse 130. T. 100·6. 7.30, transfused 30 oz. saline solution. 10.30, pulse 114, much stronger. Patient stimulated with whisky and strophanthus, progressed well, was out of bed on 18th November, and was about to go home on 21st November, when he suddenly expired from cardiac failure.

Sectio.—In addition to pyloric growth, etc., the head of the pancreas was found infiltrated, and there was a large secondary mass in the upper surface of the liver. Heart showed marked brown atrophy, and there was consolidation of the lower lobe of the right lung.

18. Mrs M., æt. 65. Carcinoma. An emaciated, anæmic woman, who has always suffered from indigestion. A year ago she noticed that she had a faint feeling and a desire for food at odd times, even during the night. In June 1901 she began to experience severe pain in the stomach three-quarters of an hour after food, which lasted for three or four hours. She had intense nausea at times, but rarely vomited. Pain prevents her from lying on her back or left side. Present weight 7 st. 8¼ lb., formerly 10 st. 11 lb. For the last six months there has been constipation. A nodular tumour occupies the epigastric region. There is slight swelling of the legs. Father died æt. 60 of jaundice, and a sister of cancer of the stomach.

Anterior isoperistaltic gastro-jejunostomy. 31st January 1902.—Large white pyloric tumour invading lesser curvature and infiltrating stomach wall. Stomach fixed. Much glandular infection. Anastomosis effected with much difficulty, the healthy gastric area was so small, and the sutures cut out through the friable tissue. Restless afternoon. No sickness during night. Vomited 6 oz. brownish material next forenoon.

2nd February.—Some sickness, less vomiting, pulse rise 120. 3rd Feb.—Pulse 117. Restless morning; had a cup of tea about 10·30, and immediately a deep-red flush appeared over the face. Patient suddenly became very weak about 1 P.M., and died at 3 P.M. Brown fluid found on dressing.

Sectio.—No peritonitis, but brown fluid present in peritoneum and leakage from sutures, which had cut out through the upper part of the anastomosis.

19. Mr T. S., æt. 48. Carcinoma. Nine months ago patient experienced a sense of pressure in the epigastric region, which came on about twenty minutes after any heavy meal, and was succeeded a few minutes later by a dull pain and water-brash. He gave up solid food and had a milk diet. Three months later he vomited twice, and was relieved thereby. Five weeks ago attacks of vomiting came on every four or seven days, half an hour after food, and persisted at intervals of ten minutes for twelve or fourteen hours. He weighs 8 st. ¾ lb., prior to his illness he was 10 st. He has of late had some coffee-ground vomit. There is a distinct feeling of resistance in the epigastrium, extending about 5 in. in breadth.

Posterior isoperistaltic gastro-jejunostomy. 31st January 1902.—Stomach small, rather fixed. The pylorus and adjacent parts were implicated in a hard mass, beyond which the walls were much thickened and infiltrated. The greater part of the growth lay under cover of the liver. Gland in omentum. Patient did well; had some vomiting on five occasions, which ceased on 5th February. It recurred, however, and he was washed out on the 11th and 17th. Prior to and after the operation the vomit contained blood, hence the stomach tube was rather feared. He required rectal alimentation, and looked so feeble that on the 20th, 22nd and 23rd he received 4 oz. daily of sterilised olive oil injected into his gluteus maximus. He got out of bed on 4th March; his temperature still remained subnormal. On 28th April he was reported as much stouter, and able to eat anything.

20. Mr J. B., æt. 40. Carcinoma. Patient got thin and lost appetite about June 1901. Discomfort after food, and vomiting set in about August. Lavage and milk diet gave temporary relief. The vomited matter was brownish and the

stools often black. Formerly weighed 11 st., now only 8 st. No free hydrochloric acid. Egg-like swelling, moving with respiration, below ensiform cartilage.

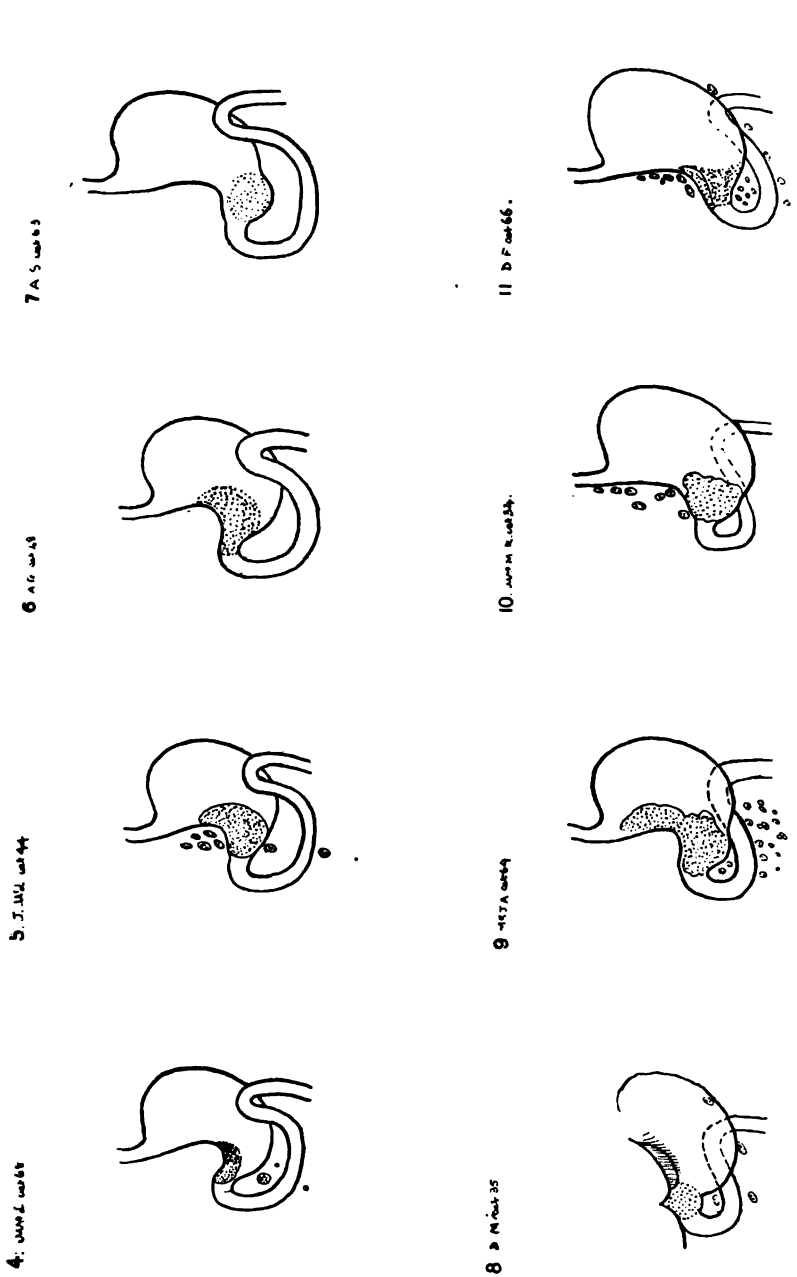
Posterior isoperistaltic gastro-jejunostomy. 24th February 1902.—Prior to operation stomach washed out. Vascular œdematous peritoneum. Pyloric tumour, with extensive omental and mesenteric glandular infection. Passed a fair night; pulse rising 112. T. 99·4, resp. 22. Washed out. Passed flatus. Out of bed 17th March.

21. Mr A. F., æt. 60. Carcinoma. In November 1901 lost taste for butcher-meat and felt weak. Increasing loss of weight and strength and discomfort followed. For last seven days vomiting came on, which gave relief. An area of resistance and dulness in right hypochondrium and epigastrium. Weighs 8 st. 3 lb.

Posterior isoperistaltic gastro-jejunostomy. 21st February 1902.—A large mass with a cicatricial-looking surface occupied the pylorus and extended into the stomach. It involved the anterior aspect mainly. There were no enlarged glands seen. Out of bed 3rd April.

Four deaths occurred within seven days, as follows—

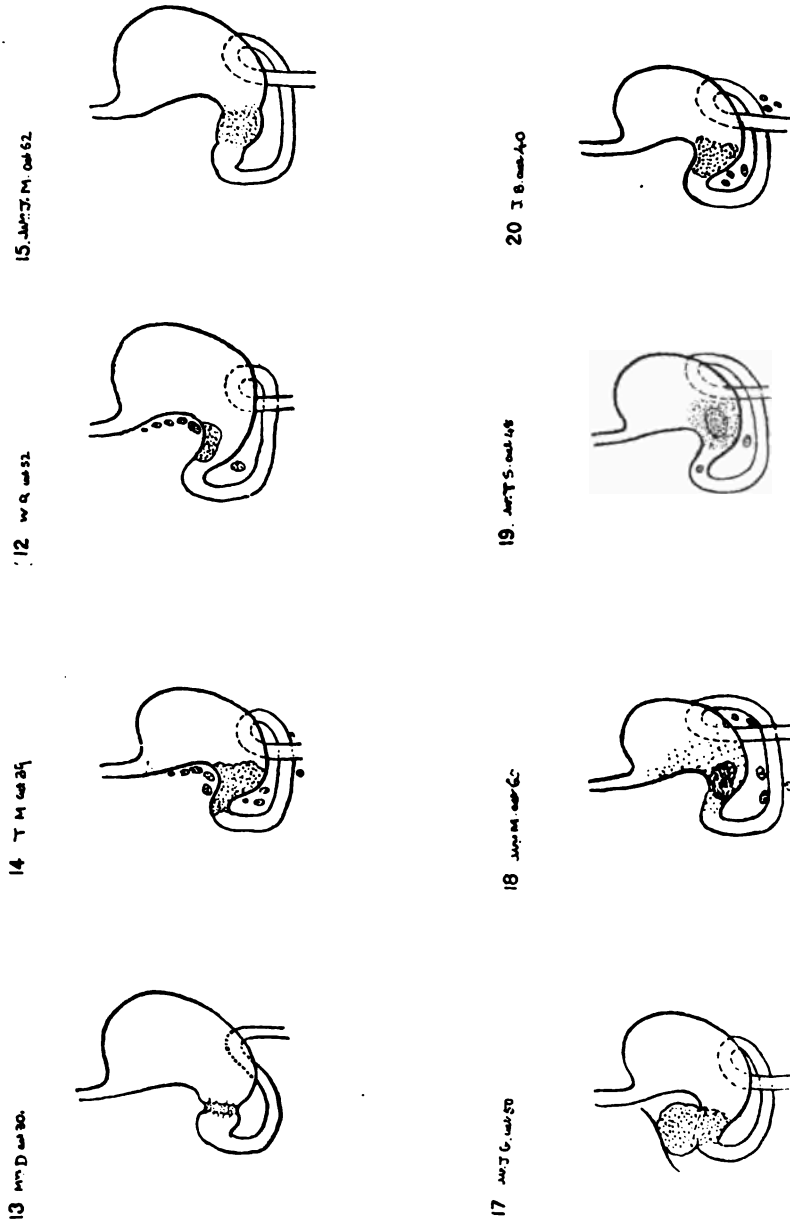
Case 11, aged 66, began to vomit the day after operation and derived no permanent benefit from washing out. It was feared that a *Circulus vitiosus* had developed. In this condition the duodenum and jejunum become filled with biliary and pancreatic secretion, and by passive distension tend to compress their companion exit loop, at the point of anastomosis. Incessant vomiting and refilling of the stomach take place, and the patient dies of starvation. The circulus vitiosus has been ascribed to various causes associated with the operation, such as the line of peristalsis and the formation of spurs, to avoid which more complicated forms of gastro-enterostomy have been devised by Braun, Kocher, Roux, etc. Mikulicz has returned to the anterior operation, regarding insufficient length of the duodenal end as unfavourable, and making his anastomosis about 50 centimetres from the pylorus, in the belief that this length of bowel will have greater peristaltic force. We have always endeavoured to make the anastomosis as close to the duodenum as possible. As there was no evidence of peritonitis in this case, the abdomen was re-opened to remedy this supposed



TO ILLUSTRATE MR CAIRD'S PAPER.

Definite Tumours and Infected Lymphatic Glands indicated by outline and dots; Areas of Infiltration by dots only.

F. M. C. del.



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circulus vitiosus, but everything was found normal. The pulmonary condition discovered at the autopsy is by no means rare in gastric surgery, and has been ascribed to the passage of thrombi, the high site of the abdominal incision interfering with respiration, to the prolonged anæsthesia, etc., but most probably is of septic origin.

Case 12, aged 52, revealed at the sectio an unsuspected localised peritonitis which, from its site and localisation, might justifiably be ascribed to aerial infection.

Case 15 was mentally depressed and physically unable to stand the operation. The sectio gave no definite information as to the fatal issue.

Case 18 should also not have been subjected to operation, as was clearly shown by the result.

Of the remaining seventeen patients, six are since dead, four have been lost sight of, seven are known to be alive and in good health.

The above cases may serve to illustrate the mortality associated with gastro-enterostomy performed on patients who, with one exception, were supposed to suffer from carcinoma, and whose general state of health and local condition contra-indicated excision of the disease. Every case that recovered derived benefit. Cases that one imagined would rapidly succumb still survive and their tumours are no longer to be palpated. This implies either a curious lack of diagnostic skill in those concerned, or the existence of a class of malignant tumour whose life history and reaction to laparotomy is as yet undefined. We have had similar experience of other "malignant tumours" which could not be removed on abdominal exploration. In this connection also we cannot do better than quote from an extensive and instructive paper by Steudel (*Beiträge zur Klinischen Chirurgie*, vol. xxiii., 1899).

"Wölfler in the 25th Congress of German Surgeons operated on a patient—who begged him to do so on her knees—and she remained at the head of her house for other two and a half years.

"Rosenheim showed in the Berlin Medical Society on the 4th November 1896 a lady in a fair state of nutrition, whom he had under treatment three years before for carcinoma of the pylorus. She could not make up her mind for a radical

operation, but, after all, had to undergo gastro-enterostomy two and a half years ago for stenosis. In the discussion Ewald and König knew of similar cases which had lived three years after gastro-enterostomy. Hahn communicated one case where all those present at the gastro-enterostomy were under the impression it was a carcinoma, and the patient died seven years later, during which time he had always felt well. Krönlein related a case of a laparotomy, where he had found a tumour of the pylorus the size of a walnut and slightly fixed, and a second and larger growth in the ligamentum gastrocolicum. On account of the second tumour he could not carry out his plan of pylorectomy. The patient lived thus for seven years in the same state of health.

Krönlein therefore considers carcinoma out of the question. He relates other cases where, after the exploratory laparotomy noticeable improvement took place, the patients believed themselves cured, and lived for three years after. The most interesting contribution, however, on this subject is made by Alsberg (*Münchener Med. Wochenschrift*, 1896, No. 50). The carcinoma found on operation was quiescent for three years, during which time the patient felt himself quite well: after this it began to grow again, and caused death in five months. At the sectio a Colloid carcinoma was found, but the lumps on the peritoneum, on account of which the radical operation was not undertaken, had entirely disappeared.

All these observations show that, in regard to a laparotomy or gastro-enterostomy, there can be a period when the growth is arrested, may be for years, indeed it might be said that it even seems to diminish, perhaps similarly to those cases of peritoneal tuberculosis. Alsberg's case is noteworthy in so far that nodules in the peritoneum, which on operation decided in favour of gastro-enterostomy, were not to be found at the sectio.

It will be a task of the next years to observe these important things; one must try to obtain a sectio on those who die later after operation. Also it might be recommended at every gastro-enterostomy or exploratory laparotomy for carcinoma to procure a part of the tumour, when possible, or a metastic gland for pathological examination, to have a proof of the nature of the disease. Perhaps it will be discovered that a certain kind of carcinoma, perhaps the Colloid carcinomas, which also in regard to their metastasis are relatively simple,

show a tendency after laparotomy to stand still, or that the question is not one of carcinoma but of sarcoma. At any rate it is practically important that there is a considerable number of cases where one must diagnose carcinoma of the stomach from the clinical point of view as well as from the condition found on operation, *who live for years after gastro-enterostomy in apparent comfort and good health.*"

Studal also reports 4 cases from Czerny's clinic where excision could not be practised, but who enjoyed good health 2½, 4, 5, and 5½ years after gastro-enterostomy. Similar illustrative cases may be found in a valuable article by Armin Huber (*Ueber Chirurgische Hilfe bei Magenkrankheiten, Correspond-Blatt für Schweizeraertze*, March 1902).

2. CYTODIAGNOSIS OF PLEURAL EFFUSIONS

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THERE are several varieties of pleural effusion where an examination of the cells in the fluid is as a rule unnecessary. These are the various forms of purulent effusion or empyema. Pus is pus all the world over, and its main scientific interest is not to be found in the cells which it contains, but in the organisms which cause its production and are to be found in it. It makes a great deal of difference to a patient's chances whether an empyema is due to the pneumococcus, streptococcus, staphylococcus, to the bursting of a tubercular cavity with a mixed infection of the pleura, to the bacillus typhosus, the bacillus coli and so on, but in almost all cases of empyema it is the organism which should be sought microscopically or by culture, while the exact look of the cells in the effusion is a matter of secondary importance.

It is in serous effusions that the cells are of importance, and the history of this question is of considerable interest. Pleurisy is one of the most common of acute chest affections, and for many years it has been matter of discussion whether the common acute serous pleurisy is rheumatic, tubercular, "idiopathic," or due to acute infection from one or other of the organisms of which I have just spoken in connection with

empyema. The pendulum of opinion has swung now in one direction, now in another. At one time all serous pleurisies were dubbed "rheumatic," at another they were "idiopathic," and more recently the tendency to regard them all as tubercular has been steadily growing. Since the recognition of the importance of early diagnosis of tubercle of the lungs, this question has aroused even greater interest than before, because not only is the immediate treatment necessarily different according as one regards a pleurisy as tubercular or as idiopathic and harmless, but in many cases the whole future life of the patient will, or ought to, be coloured by the decision arrived at. A certain proportion of cases does not come into consideration—those in which a pleurisy supervenes in the course of a phthisis already diagnosed, or where the physical signs are sufficiently definite to allow of a diagnosis on the first examination. It will very often be found in these cases that it is the lung whose pleura is not affected which is apparently further advanced in tubercle than the affected one.

But there are many cases where the lungs give us no help, and where the pleurisy occurs in people apparently healthy. Here all the ordinary means of diagnosis may be exhausted without a decision as to the nature of the case being arrived at. The case may be really phthisical, but the physical signs may be so slight as to pass undetected; and if it is the more seriously diseased lung whose pleura is attacked, the effusion may conceal the disease by relaxing the lung or limiting the movements of the affected side so as to weaken the breathing. On the other hand bronchial breathing and other auscultatory signs may be caused by the effusion itself and cannot be referred to a pre-existing tuberculosis. For similar reasons tubercle bacilli may be sought in vain in the sputum. Either there is no sputum, or what there is comes from the unaffected or less affected lung, or from the trachea and bronchi, and not from the relaxed lung. The injection of tuberculin for diagnostic purposes is also useless, for almost all of these cases are associated with fever, so that a rise of temperature could not be regarded as a recation to the injection. The sero-diagnosis of tubercle has been found to be beset with so many technical difficulties, and even in the hands of those who have studied it to be so inconstant in its results, that it is quite valueless for practical purposes, whether it be applied to the serum of the

blood or to the pleural exudate. The morphological examination of the blood does not give much help: in severe cases the leucocytosis may be high; there is usually only a moderate rise, and in slighter and more chronic cases the blood is practically normal. The differential leucocyte count has not yet been found to give any definite indication.

In the absence of general indications, the fluid drawn off by puncture falls to be examined, and the obvious thing to do is to search for organisms in it. It is perhaps hardly sufficiently realised that the organisms of acute infection, such as the streptococcus and pneumococcus, are capable of causing serous pleurisies as well as purulent effusions. These serous exudates may become purulent, but often either remain serous or are rapidly reabsorbed. In fresh exudates the organisms may be discovered by culture or by the microscope, but the fluid is strongly bactericidal, and after some time the organisms cease to be capable of cultivation, though they may still be found in the fluid, and finally they can no longer be discovered. Hence it is not proper to say, as some have done, that all effusions in which organisms cannot be found are tubercular. It is nevertheless true that in undoubtedly tubercular cases it is only very rarely possible to demonstrate tubercle bacilli either microscopically or by culture, either because very few bacilli are present, because they are destroyed or rendered incapable of growth by the fluid, or because the effusion is caused by the toxin rather than by the organism itself. In this dilemma use has often been made of that living culture-medium, the guinea-pig, and the pleural fluid injected intraperitoneally is often found to cause tuberculosis although no bacilli have been discovered. In addition, however, to the legal and other difficulties which surround this procedure, and to the length of time, three weeks, which must elapse before a conclusive result is obtained, one must bear in mind that it does not give a positive answer in all cases of undoubted tuberculosis for the reasons already given. It has been shown that a positive result is more frequent the greater the amount of fluid injected. 70 c.cm. seems to be the most convenient quantity, and this is of course much more than the hypodermic syringeful which is usually employed. Chemical examination of the fluid gives no assistance, and attention was turned to the cells to be found in the exudate.

Widal and Ravaut (*Comptes rendus d. l. Soc. de biol.*, June 1900) in France, and Wolff (*Zeits. f. Klin. Med.*, 1901) in Germany, at about the same time published papers on this subject, and since then numerous communications have appeared, especially in France. In this country comparatively little has been done on the subject.

The methods to be employed are simple enough. The fluid is to be drawn from the chest with a syringe of any kind or size most convenient, provided that a sufficient quantity is procured to be centrifuged with ease. The syringe should be sterilised by boiling where this is possible, or, if antiseptics have to be used, should be thoroughly washed out with boiled water afterwards, as traces of antiseptics may destroy some of the cells present, or considerably alter their staining reactions. The only advantage of examining the fluid microscopically in the fresh state is that the number of cells present may be gauged. If they are numerous, the fluid need not be centrifuged; but the required number of cover-glass preparations may be made at once by putting a drop on one cover, superimposing another, sliding them apart, and allowing them to dry in the air. Too large a drop should not be taken, or if this has happened accidentally, the drying may be hastened by gentle heat. The procedure, so far, is exactly the same as that used for making blood-films, and the same care should be taken that the cover-glasses are perfectly clean.

If the cells are few in number, the fluid must be centrifuged, if possible before it coagulates; but coagulation does not, so far as I have seen, greatly alter the number or character of the cells present. Wolff recommends that, if the fluid is very rich in albumin, as most of them are, the supernatant liquid should be poured off, the tube filled up with normal salt solution, and the whole re-centrifuged. I have never done this, nor found it necessary. After centrifuging, cover-glass preparations are to be made from the deposit as above.

These cover-glass films can now be fixed by any of the methods in use for fixing blood-films; I have generally used my formalin-alcohol method. Theoretically, one would expect that any of the stains in use for blood might also be employed; but Ehrlich's triacid stain is not very serviceable, and those I have found most useful are eosin and

methylene blue, either a saturated watery solution or Löffler's, Jenner's stain, and Pappenheim's modification of the triacid stain. Leishman's stain, and eosin and hæmatoxylin are less useful, as they do not bring out the granules of the polymorphonuclear cells, and it is often important to be able to do this, when degenerative changes have occurred in them. In order to show some of these changes, and for confirmatory purposes, it is often advisable to use Sudan III. or Scharlach R., followed by hæmatoxylin, when fat is in question; or iodine, when glycogen is to be looked for. Wolff objects to the use of eosin, or any of the other acid stains in use, followed by hæmatoxylin or methylene blue, because he finds that the ground substance between the cells is coloured so deeply by the acid stain that it becomes difficult to differentiate between the cells. I have only been troubled by this when uncentrifuged fluid was used, and too thick a layer allowed to dry on the cover-glass. If the fluid be centrifuged, only a very small drop of the deposit need be taken; it should spread out evenly over the cover-glasses, and need give rise to little or no trouble in this respect, for though the amount of proteid in pleural fluid is often very high, up to 8 per cent., it is never higher than that of blood, and need not give rise to any greater amount of disturbance in staining.

The cells found in exudates may be classed according as they are derived from the blood or from the tissues. Shreds of fibrin are, of course, sometimes found, but are easily recognised.

CELLS FROM THE BLOOD.—Of these, there are red blood corpuscles, and of leucocytes, the polymorphonuclear neutrophiles and the lymphocytes of various sizes. Basophile leucocytes (Fig. *o*) are occasionally met with, but in no constant relation, though I have certainly seen them most frequently in tubercular cases; eosinophiles are almost never seen.

The red corpuscles show no changes of importance, as pleural fluid is practically isotonic with blood-plasma.

The polymorphonuclear neutrophiles may exactly resemble those seen in the blood, and usually do so in fresh effusions. But when the fluid has lain in the pleural cavity for some time, degenerative changes take place in these cells. They can hardly result from want of nourishment, but may be due partly to toxic influences, partly to deprivation of oxygen.

These changes may be classified according as they affect the cell-body and granules and the nucleus, though, of course, in many cells both nucleus and cell-body are altered.

The cell body. (1) *Simple dissolution.*—When this occurs, the cell-body breaks up, and the granules, or microsomes, become free in the fluid ; and, when this is examined in the fresh state, often look like minute fat globules, but when stained, are seen to be proteid in character. Some of the granules long remain adherent to the nucleus (Figs. *f*, *h*, *i*). In other cases, the granules disappear from the cell-body, which remains unaltered in size, or, at anyrate, they cease to stain characteristically (Fig. *g*).

(2) *Fatty degeneration.*—This change, which is very rare in cells circulating in the blood, is fairly common in exudates. It may occur in cells which are unaltered in size, or which have lost part or the whole of their granules. It cannot well be brought out by osmic acid, but shows best with the anilins which have a physical affinity for fat, such as Sudan III., or Scharlach R., which Michaelis has recently introduced. It is a change which occurs apparently with some capriciousness, and is often very useful in determining the character of degenerated cells, because it does not appear in the small lymphocytes. The fat globules are almost always small (Fig. *e*).

(3) *Glycogenic degeneration.*—Cells showing this change are often found in the blood, but appear to be more frequent in exudates. The granules of glycogen are brought out by exposing the dry films to the vapour of iodine, and mounting in gum saturated with iodine. The only diagnostic importance of this change is that it also does not appear in lymphocytes.

The nucleus.—This may simply lose its power of taking up basic stains, and look faintly coloured (Fig. *d*) ; but a very common change is to find it losing the intranuclear network and staining deeply and homogeneously, and in addition to find either that the lobes of the nucleus separate one from another and break up into fragments, each taking a part of the cell body with it, or that the nucleus as a whole runs together into a ball, staining homogeneously (Figs. *f*, *g*, *h*, *i*, *j*). These deeply-stained nuclei with a zone of cell-body around them which with eosin, for example, stains a deep pink, have been

taken by some observers for nucleated red corpuscles, which of course could not appear in the pleura; or for lymphocytes, and they have been called "pseudo-lymphocytes" (Fig. *j*).

The lymphocytes.—These are generally exactly like those in the blood (Figs. *k*, *l*, *m*); usually the small lymphocytes are in the largest proportion, but unless the precaution has been taken to make the films thin, they are often not so well spread out as blood-lymphocytes and do not show the basophile rim so distinctly (Fig. *n*). Some authors, Wolff for instance, do not believe that the large lymphocytes (large mononuclear cells of Ehrlich) appear in pleural fluids (*Berl. Klin. Woch.*, 1901 and 1902), and think that the cells taken for them are in reality altered endothelial cells; but I have repeatedly seen perfectly typical examples (Figs. *l*, *m*). The lymphocytes do not appear to degenerate with anything like the same frequency as the polymorphonuclear cells.

CELLS FROM THE TISSUES.—The only cells which appear in ordinary effusions are the endothelial cells from the surface of the pleura. Sometimes these appear in clumps, when they are not easily mistaken for anything else, but more frequently they are separate. They are larger cells than leucocytes as a rule, have a round, or very frequently an oval, nucleus with distinct chromatin network, and a large cell-body which may have a regular round or angular oval outline, but is more usually ragged at the edges. Fat droplets sometimes appear in the cell-body. Wolff lays some stress on the phagorytic tendencies of the endothelial cells, and describes characteristic changes in them as a result of this process, but I am more inclined to regard the phagocytic cells which I have seen in exudates as large lymphocytes or hyaline leucocytes. It seems *a priori* unlikely that cast-off endothelial cells will indulge in cannibalism, and the cells I have seen, and those Wolff describes, are much more like the larger macrophages of lymphoid tissue. In any case they occur but rarely. It will be seen from Figs. *n* and *o* that the smaller of the endothelial cells are not unlike large lymphocytes. The extreme frequency with which fat droplets appear in them is one point of distinction. Another is the fact that like most connective tissue nuclei, their nuclei contain one or two large nucleoli, which can usually be made out, unless the cell is much degenerated. When the cell-body has quite disappeared, and

when the nucleoli are not brought out, the distinction from lymphocytes may be very difficult.

For some years back I have been in the habit of examining pleural and other effusions in the way I have described, and have gathered a large amount of material. It is unnecessary to give a statistical account of this, however, for I have found my results largely anticipated and corroborated by those workers I have named (Wolff, *Forts. d. Med.*, April 1, 1902), and I may therefore simply give the general views held by all observers at the present time. Almost the only discordant voice is that of an Italian, Patella (*Deutsch. Med. Woch.*, April 17, 1902), who, on what seem to me entirely insufficient grounds, endeavours to show that all the different forms of cells observed, especially lymphocytes, are really degenerated endothelial cells.

Tubercular effusions.—In these the picture differs according to whether the effusion is examined during the first three days or later. At first the cells seem (I have no preparations of so early a date, and rely on Wolff's statement) to be mainly polymorphonuclears, but by the third day these have largely disappeared from the effusion and their place is taken by lymphocytes, so that the microscopic picture of an established tubercular pleurisy consists of lymphocytes, red blood corpuscles, a few polymorphs in some cases, and sometimes a very few endothelial cells. The lymphocytes and red blood corpuscles are present in nearly equal numbers, and the lymphocytes ought to be at least half of the true cellular elements (apart from red corpuscles), while in most cases they reach four-fifths or even more. The same course has been found in tubercular effusions produced experimentally, first polymorphs, later lymphocytes. I do not propose here to discuss the source of the lymphocytes, whether they are derived from the blood by chemotaxis, or whether they are cast off from tubercular granulomata of the pleural surface. The purpose of this paper is purely to point out diagnostic indications. I have laid special stress in the foregoing pages on the degenerative changes in other cells which cause them to look like lymphocytes, because of the great importance which a true lymphocytic effusion has. I have seen effusions in which the degenerated polymorphs which simulate lymphocytes were at least as numerous as the unaltered polymorphs, and here it would have

been easy to come to an erroneous conclusion as to the nature of the case if one had not known the true nature of the cells in question. The small number of endothelial cells present in tubercular cases is generally explained by assuming that exudation rapidly covers the pleural surface in these cases.

Effusions due to the pneumococcus and streptococcus.—These organisms, and probably all the others which can cause purulent effusions, have, when the effusion is in the serous stage, and in cases where it never goes beyond that stage, the same result. The effusions show at all stages a great preponderance of polymorphonuclears, unaltered or degenerated as the case may be, and often numerous endothelial cells, fresh or degenerated. Red corpuscles may also be present in varying numbers. The relations between polymorphs and endothelial cells vary greatly in different cases; the more acute the case and the more likely to go on to empyema, the more polymorphs will as a rule be present.

Œdematous effusions.—In these, whether they arise in heart or kidney cases, the cells are almost always very few in number, and consist mainly of endothelial cells, often lying together in clumps. The same holds true of fluid drawn from tissue œdemas in heart cases, for example, where the cells present are usually only those which might come from accidental admixture with blood. An exception must be made in cases where a pulmonary apoplexy occurs in a lung whose pleura already contains fluid. Here polymorphs appear in the fluid at the same time as blood appears in the sputum. I have examined two cases of effusion in leucocythæmias. In one, a lymphæmia, the effusion was œdematous in character, and showed only a few endothelial cells; in the other, a myelæmia, the fluid was rich in degenerated forms of all the varieties of leucocytes found in the blood. These were probably derived from some metastatic deposit in the wall—I had no opportunity of ascertaining this, however.

Malignant pleurisies.—My experience of these is comparatively small, as it happens that I have only come across three or four since I began to examine all effusions as a matter of routine. Little has been written on the subject. Generally speaking, cells of the malignant growth will be found in the fluid, often in great numbers (Figs. *t*, *u*, *v*, *w*, *x*). They are often swollen and œdematous usually larger than any of the ordinary

cells found, and showing abnormalities in the nucleus. They are often fattily degenerated. A certain proportion of polymorphs is present, and in one case of malignant disease of the lung with pleurisy which I examined I could find no tumour cells, and nothing but degenerated polymorphs. Here the pleurisy was probably due not to malignant infection of the pleura, but to an incidental bacterial infection.

I have said nothing so far as to pericardial and peritoneal effusions, and our knowledge of these is very limited. Pericardial effusions are not often examined; and while ascitic fluids are frequently enough obtainable, the peritoneum contains so many organs and ascites may be caused by so many different conditions that it has not yet been possible to reduce the appearances found to any rule. The pleura, on the other hand, is charmingly simple in its relations, and in the diseases which affect it. I have no experience of lumbar puncture and can therefore say nothing of the cells to be found in cerebrospinal fluid, nor, so far as my reading has gone, have any important results yet been arrived at in regard to it.

The methods I have described are not in practice difficult to carry out; anyone with a fair knowledge of histology and staining methods can manage them, and I have found them distinctly useful. I have been able to free some people from the suspicion of tubercle, and, unfortunately, have had to condemn others. Far be it from me to suggest that cytodiagnosis is to be allowed to usurp the place of other methods of examination; it can only be of value when associated with the minutest investigation in other directions, but as I have myself found it a valuable aid, I have described it and its results in the hope that others may similarly benefit.

Explanation of the Figures.

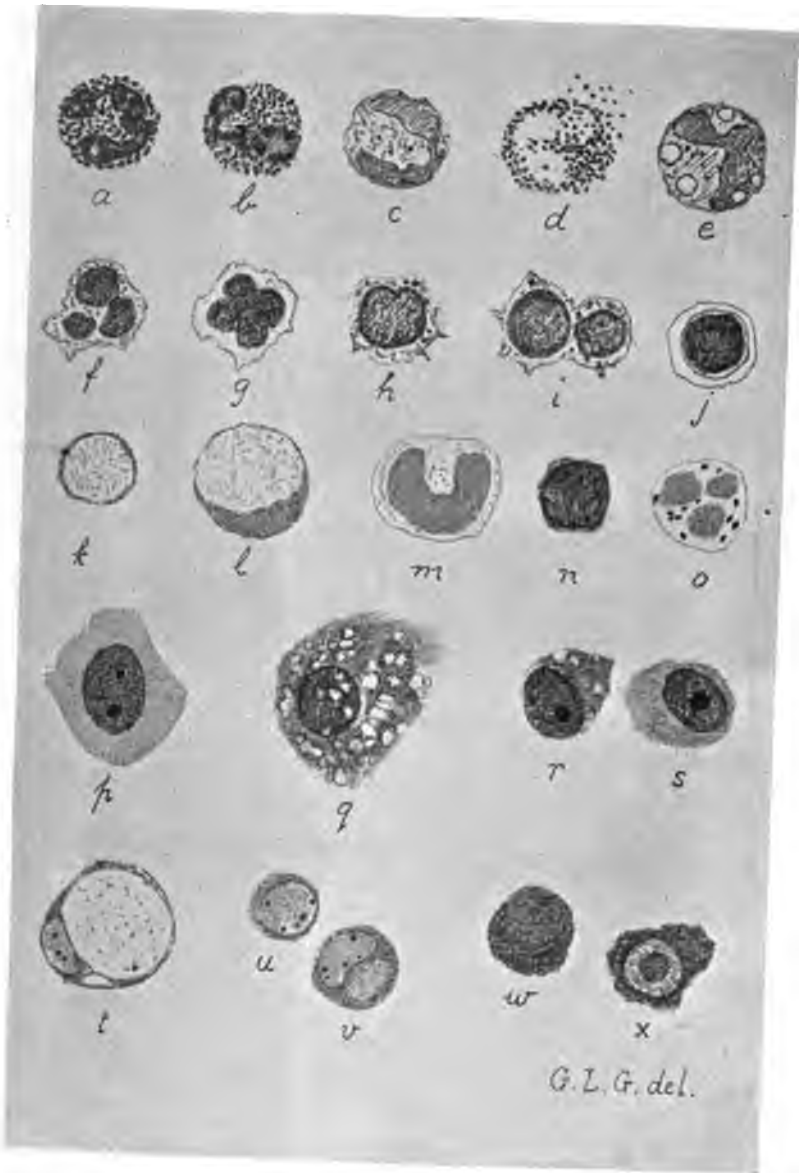
These were all drawn from actual cells, as nearly typical as possible, and are approximately on the same scale. Figs. *t*, *u*, and *v* are half the size of the others. In order to ensure similarity of appearance, all were taken from eosin-methylene-blue films.

a, *b*.—Typical polymorphonuclear neutrophiles.

c-j.—Degenerated polymorphonuclear neutrophiles, *c* to show faint staining of nucleus, and disappearance of most of the granules.

d.—Faint staining of nucleus and shedding of granules.

e.—Fat globules in degenerated cell.



TO ILLUSTRATE DR GULLAND'S PAPER.

f.—Nucleus breaking up into fragments, and staining homogeneously; most of granules shed; probably derived from a form like *a*.

g.—Fragments of nucleus clumping together, intermediate between *f* and *h*.

h.—One form of "pseudo-lymphocyte."

i.—Degenerated form of cell like *b*; nucleus fragmented, and cell apparently about to follow.

j.—Another form of "pseudo-lymphocyte," probably derived from fragmentation of such a form as *i*; nucleus has slightly shrunk from cell-body. As the granules have disappeared, this form has been taken for a nucleated red corpuscle.

k.—Small lymphocyte, well flattened out, so as to show the basophile rim and faintly-stained nucleus.

l and *m.*—Large lymphocytes, *l* with faint round nucleus, *m* with horse-shoe nucleus (from different preparations).

n.—Small lymphocyte from thick film, not flattened out, so that nucleus is deeply stained, and rim hardly visible.

o.—Basophile leucocyte, faint trilobed nucleus, and a few granules (deep purple). In pleural fluids most of the granules seem to be shed.

p.—Endothelial cell from pleural surface, undegenerated.

q.—The same, fattily degenerated.

r.—The same, fattily degenerated.

s.—The same; note resemblance of *r* and *s* to large lymphocytes.

t, u, v.—Cells from malignant pleurisy, probably cancerous.

w, x.—Cells from malignant pleurisy, due to small round-celled sarcoma.

Meeting X.—May 21st, 1902

PROFESSOR T. R. FRASER, M.D., LL.D., *President, in the Chair*

This was a special Clinical Meeting held in the Royal Hospital for Sick Children.

I. EXHIBITION OF PATIENTS

1. *Dr T. Burn-Murdoch* exhibited—

(*a*) Cases illustrative of INFANTILE PARALYSIS. The first a simple case of unilateral paralysis of the leg. The second one of paralysis of both legs. The third an unusual form where both arms were paralysed, along with many of the post-cervical muscles, the sterno-mastoids being unaffected.

(*b*) A case of MICROCEPHALIC IDIOCY in an infant.

(*c*) A case of BRONCHIECTASIS in a boy, showing the chronic nature of the malady. Its characteristic relapses, the

very fœtid expectoration emitted in several ounces at a time, with spasmodic cough, and the clubbing of fingers and toes were well illustrated. Marked physical signs, including chest deformity, and those of cavity formation were present. The absence of tubercle bacilli, the impossibility of diagnosing with certainty whether one large cavity or multiple small ones were present in such cases, were commented upon.

2. *Mr H. J. Stiles* exhibited—

(*a*) A case of POSTERIOR BASIC MENINGITIS from Dr Burn-Murdoch's ward. The head retraction was well marked, and the patient presented all the characteristic features of the disease. The result of the inflammatory exudation and adhesions at the base of the brain had been to close the foramen of Magendie, and to bring about a secondary distension of the ventricles.

In this case Mr Stiles had tapped the lateral ventricles through the coronal suture, at a point one inch from the middle line. Six drachms of turbid and somewhat amber-coloured fluid were removed with the ordinary exploring syringe, first from the one lateral ventricle and three days later from that of the opposite side. Dr Stuart M'Donald had obtained from the fluid a pure culture of the diplococcus intracellularis of Weichselbaum.

As a result of the tapping the bulging of the anterior fontanelle had disappeared, and there was a distinct improvement in the general condition of the child, as evidenced, more especially by the marked diminution in the retraction of the head. In this disease Mr Stiles regarded tapping of the lateral ventricles as more efficacious than lumbar punctures. At the suggestion of Dr Bruce, he had in two previous cases trephined immediately above the foramen magnum and opened the fourth ventricle. Both patients died during the third week after the operation. He (Mr Stiles) had abandoned this method in favour of simple tapping of the lateral ventricles, a procedure which he thought should be had recourse to in all cases at an early stage of disease, in order, if possible, to prevent the blindness which not infrequently occurs as the result of optic atrophy.

(*b*) A child, aged 2½ years, after linear craniectomy for MICROCEPHALUS.

The child exhibited all the typical features of a microcephalic idiot. The parents pressed an operation, although it had been explained to them that little or no good was to be expected from surgical interference. Eight weeks ago Mr Stiles performed linear craniectomy according to the method of Dumont. The steps of the operation were as follows :—

1. An incision along the middle line of the scalp from the upper part of the forehead to the posterior pole of the skull.

2. Left half of the scalp reflected downwards, the pericranium being left in situ.

3. Skull trephined a little above base of mastoid process.

4. A strip of bone, 1 cm. wide, removed with Hoffmann's forceps along the whole of the left half of the greatest horizontal circumference of the cranium.

5. Dura divided for a corresponding extent, two narrow bridges being left undivided, the one containing the anterior and the other the posterior branch of the middle meningeal artery.

6. Scalp replaced and sutured.

The shock was not alarming. On the second day after the operation the child was sitting up in bed playing with its toy. Cerebrospinal fluid escaped from the anterior end of the wound for a fortnight. The child has been in excellent health since the operation.

The mother thinks that the child displays more intelligence, but Mr Stiles was not sure that he was able to confirm her impression. A distinct groove could be felt through the scalp along the line of the craniectomy, and it was interesting to note that the side of the cranium upon which the operation had been performed was already quite perceptibly larger than the opposite side.

The chief point wherein this operation differs from those performed by Lannelongue and others lies in the division of the dura as well as the bone. The object of this is to prevent the subsequent obliteration of the artificial suture by the formation of new bone, which we now know develops to a much greater extent from the dura than from the pericranium. The patient has now returned to hospital to have the other side of the scalp operated on in a similar manner, the result being the formation of an artificial suture around the entire circumference of the scalp.

(*c*) A child, aged 2½ years, with a MIXED (CUTANEOUS AND SUBCUTANEOUS) NÆVUS, involving almost the whole of the left side of the face, including the eyelids, part of the nose and upper lip, the anterior half of the scalp, part of the neck, and the upper and back part of the shoulder.

Mr Stiles stated that he had been very disappointed with the results of electrolysis in the treatment of prominent mixed nævi. He had obtained better results with the actual cautery, applied in the form of multiple punctures made vertically to the surface, the distance between the punctures being rather greater than the diameter of the punctures themselves. The operation is concluded by rubbing iodoform (out of 1 : 1000 sublimate solution) into the punctures, and then applying a dressing consisting of dry sterilised gauze. Each puncture acts as a centre for cicatrization, and although a certain amount of ulceration may take place, healing and epidermic formation rapidly occurs from the islands of epidermis which intervene between the punctures. This was the method which Mr Stiles intended to employ in the case shown.

(*d*) A boy, aged 4 years, with DIFFUSE TUBERCULOUS OSTEOMYELITIS of both tibæ. The whole diaphysis was thickened, and the skiagrams, taken by Dr Rainy, showed an abnormally light shadow resulting from the rarefaction produced by the tuberculous infiltration of the medulla and surrounding cancellated bone. The thickening was caused by new formation of bone from the periosteum. The patient had previously been treated in hospital for tuberculous osteomyelitis of the calvarium.

In Mr Stiles' opinion, the best method of dealing with such a condition was to perform subperiosteal resection of the whole diaphysis at a comparatively early stage of the disease, that is to say, before the development of secondary abscesses in the surrounding soft parts. In his experience it had not been sufficient merely to open into, and gouge out, the medullary canal, as such a procedure was almost invariably followed by recurrence of the disease.

(*e*) A child, aged 3 years, after operation for CANCRUM ORIS. The patient was brought to hospital with a characteristic black slough upon the cheek, surrounded by an area of acute inflammatory œdema; there was also ulceration and

sloughing of the gum, exposure and some necrosis of the lower jaw and loosening of the teeth.

Mr Stiles directed Dr Paul, the house surgeon, to freely excise the gangrenous area with the knife, and then to swab the raw surface with Merek's strong solution of peroxide of hydrogen—a solution which possesses three times the strength of the pharmacopœial preparation. The constitutional symptoms rapidly disappeared, the sloughing ceased, and a healthy granulating surface was soon substituted.

The child could now open the mouth without difficulty, and the deformity was much less than one anticipated.

Mr Stiles wished to direct attention to the value of the strong solution of peroxide of hydrogen in these cases.

(*f*) A child, aged 6 years, after excision of the ankle for TUBERCULAR DISEASE.

The method of excision (Kocher's operation) consisted in making an external J-shaped incision, with division and subsequent suture of the peronei tendons. After dividing the lateral and anterior ligaments of the ankle, the foot is completely dislocated inwards; this gives free access to the joint, and greatly facilitates the complete removal of all the disease, including the astragalus if necessary. The internal lateral ligaments, as well as the two malleoli, are left intact, and serve as valuable supports.

Mr Jacobson, in the last edition of his valuable book on "The Operations of Surgery," opens the chapter on incision of the ankle with the following sentence: "This operation is one of very disputed value, and thus rarely performed."

In Mr Stiles' experience, excision of the ankle, performed as above stated, had yielded excellent results; indeed, of all the excisions of joints, he regarded those of the knee and ankle as the most satisfactory.

Of the two cases of excision of the knee, performed according to the method of Kocher, one was done in December 1898, the other in July 1899.

The advantage of the method over those usually employed was that it provided free access for the complete removal of the disease, and at the same time retained intact the whole of the quadriceps extensor apparatus. By paring away the cartilage of the femur so as to leave a convex surface, and

by removing the cartilage of the tibia so as to leave a concave surface, the resulting shortening is reduced to a minimum, and the raw bony surfaces can be so accurately retained in position that there is no necessity to wire or nail the osseous surfaces into position. By retaining the quadriceps apparatus intact, the limb retained a comparatively normal configuration.

Mr Stiles desired to direct attention to the position in which he was in the habit of placing the limb during the first three weeks or so after the operation, he maintaining the limb in the upright position by bandaging it to a vertical support added to the ordinary Hamilton's double long splint. The advantages of maintaining the limb in the vertical position are :—

1. That there is less reactionary bleeding, and therefore no necessity for the introduction of a drainage tube.

2. The venous return is greatly favoured, so that there is no œdema, no tension, no pain.

3. The weight of the leg upon the thigh is an advantage in keeping the osseous surfaces in close contact.

4. The danger in young children of the dressings becoming soiled with urine is entirely obviated.

As a rule the dressings need not be changed until the end of the second or third week, after which the limb may be placed in the horizontal position. Mr Stiles showed a child whose knee he had excised nineteen days ago. The dressings, which had not been changed since the operation, were removed. The wound was soundly healed, and there was no trace of œdema. The splint was then exhibited.

(*g*) An affection of the HIP-JOINT FOR DIAGNOSIS.

The child, aged 3½ years, had been slightly lame ever since it began to walk. The movements at the hip, which were somewhat restricted, were attended with a peculiar creaking, resembling that felt in chronic osteo-arthritis. There was no pain or tenderness. The trochanter was slightly thickened, and slightly higher than on the sound side. There was certainly no congenital dislocation. The skiagram showed thickening of the neck and trochanter, and slight deformity of the head. The labour had been a difficult one, necessitating version, and it was possible that the upper epiphysis of the femur may have been separated or otherwise injured ; on the

other hand, the child had suffered from ophthalmia neonatorum, and therefore there was the possibility that the condition may have been the result of a gonorrhœal arthritis.

3. *Dr G. H. Melville Dunlop* exhibited—

(*a*) A case of HEMIHYPERTROPHY.

Alex. G., 9 years old. The difference between the two sides was noticed at birth, and this difference has been maintained, but not increased, with the growth of the child. This has been ascertained by repeated measurements during the last three years. In this case the head and face are not involved, the hypertrophy being limited to the trunk and limbs of the left side. Usually the right side is the one hypertrophied.

The hypertrophy involves both bones and soft parts, as the skiagram by Dr Rainy (exhibited) shows, and the want of symmetry between the two sides is most evident in the distal parts of the extremities—hands and fingers, feet and toes. Not only the circumference but the length of the limbs is increased. Measurements were taken in 1899 and again in 1902, and the differences between the two sides remain practically the same. The left leg is 1½ inches longer than the right, and the left arm 1 inch longer than its neighbour. As a rule the hypertrophy in circumference is more marked than that of length, but it is not so in this case.

The left thigh is half an inch, and the left calf three-quarters of an inch larger than the right, and the left forearm 1½ inch greater than its neighbour. The greatest difference is to be seen in the hands and feet, especially in the feet, the length and breadth of the left foot being appreciably larger, and the left great toe considerably bigger than the right. The circumference of the left chest at the xiphisternum is from 1½ to 2 inches greater than that on the right side. The scapula is half an inch longer on the left side, and the left nipple is more prominent.

The sweat glands are more active on the left side, and the temperature, which was carefully observed for several weeks, was at least 1° F. lower in the right than in the left axilla, and it took much longer to assume its maximum limit. There was no irregularity in the eruption of the teeth on the

two sides, and they are of equal size, and there is no difference in the growth of hair and nails on the two sides, as sometimes occurs. The labour was normal, and there was no known cause for the condition. As so frequently occurs in these cases, there are patches of a purplish appearance resembling capillary nævi, which are diffuse and general on the buttocks, but at other places patches of smaller or larger size are to be seen. They are not confined to the affected side, though chiefly present there. The colour disappears on pressure, and is intensified when the boy cries. At certain places, especially between the shoulders, dilated veins occur. The grip on the left side is much stronger.

(*b*) Case of PERSISTENT PURPURA.

K. C., aged 8, was admitted to his ward in March 1901, with a history of blotches on the skin of six weeks' duration. She was a strong, robust, healthy girl. On admission all over her body and face there were small purpuric spots the size of a pin's head. Gradually, as time went on, the spots became larger and larger, till they gained the size of a saucer. The more recent ones were swollen and slightly tender, but the child was unaware of their presence till her attention was drawn to them, or until they were touched. The more recent ecchymoses were of a deep colour—purple, gradually fading to yellow, and ultimately leaving the skin stained and darkened. They occurred all over the body, but were more abundant and larger over the bony prominences—knee, elbow, ankle, spine and iliac crest. At times no fresh spots would appear for some weeks; but, when we were commencing to congratulate ourselves that the girl was getting better, fresh crops would suddenly reappear without any apparent reason. If she falls or gets a knock large ecchymoses result. About four months ago hæmorrhages commenced from the nose and gums, and have recurred from time to time, lasting several days. The general health has been very good, and, despite the bleeding, no anemia. Complains occasionally of slight pain and stiffness in the joints, but no swelling has ever been observed. The roof of the mouth shows extensive purplish ecchymoses over the hard palate and extending to soft palate, and there are smaller points of hæmorrhage on the gums and lips of a bright red colour. Repeated examinations of blood have revealed nothing

abnormal till about six weeks ago, when, after a very profuse hæmorrhage, signs of anemia appeared. She is now commencing to pick up. There has never been any bleeding from the kidneys or stomach. The spleen is not enlarged, there has been no fever, the heart is not affected, nor have the joints ever been swollen. She has been treated with large doses of chloride of calcium, ergot, gallic acid, terebene, supra-renal extract, iodide of potash and lime juice, chloride of adrenaline without any appreciable result. The only drug from which she seems to have derived any benefit is Sod. Salicyl. in large doses.

The case corresponds to what is described by Marfan and Comby in their book as "The Malady of Werlhof," which is characterised by huge hæmorrhages into the skin and from the mucous membranes, occurring quite suddenly without known cause, without envolvement of joints or pain of any sort, and without gastric trouble. There is never hæmorrhage from the kidney or lungs, and in most cases there are similar appearances found on the lips and gums to what I have described in this case. It occurs in girls over five years, and, though generally of short duration, occasionally assumes a chronic course. The children, as a rule, are in perfect health, and there is no known cause.

(*c*) A CRETIN, aged 9, who has been under treatment for seven years.

John J., aged 9 years, was first brought under observation seven years ago, at the age of 2, when he was under Dr James Carmichael's care in the Children's Hospital and treated for cretinism. From a report of the case at that time, which Dr Carmichael has kindly allowed him to make use of, it was noted that he was a fat, flabby child, and that the subcutaneous tissues were much swollen. The head was large, the nose flat, the limbs stunted, and the skin thick and dry. He had eight teeth, and the fontanelle was not closed. The mouth was kept open and the tongue was enlarged. His forehead was wrinkled, and he was very costive. He was unable to walk, was mentally undeveloped, and passed his motions involuntarily. He was put on thyroid treatment and grew rapidly, lost 5 lbs. in six weeks, got much thinner, and improved mentally. On going out of hospital parents discontinued the treatment, but brought him back again in a year

in the same languid, listless condition. This state of matters has gone on at intervals ever since. He is kept in hospital for a month or two and treated with thyroid, when all the myxœdemic symptoms disappear. His mother then takes him home, discontinues the treatment, and the child quickly relapses, and when the symptoms have become fairly pronounced he is again brought for treatment. He was brought here yesterday after a couple of months' cessation of treatment, and anyone can at a glance recognise many of the typical symptoms of cretinism by the waxy complexion, the spade-like hands, the dry skin, the apathetic, phlegmatic appearance, and the sluggish movements. The child's neck is short, the nose broad and thick, also the lips. No thyroid can be felt, and there are pads of fat under the clavicles. The boy is always cold, and the temperature is subnormal. The tongue is not enlarged now. He now has hair on his scalp. The boy has grown considerably and is now 40 inches in height, but is still much below the average of a boy of nine (50 inches), weighs 35¼ instead of 60 lbs., and his mental condition is also much below the normal standard.

When put under treatment he rapidly loses the characteristic expression, loses weight, and becomes full of fun and mischief and very lively, but always remains very determined and obstinate.

(*d*) Cases of PSEUDO-HYPERTROPHIC PARALYSIS.

James D., aged 6½, did not commence to walk till 2½ years old, and ever since he has been able to move about he has been very unsteady on his legs, constantly falling. He cannot walk very far, gets easily tired, and if not carried just sits down.

So far as can be ascertained there is no history of any relatives having been similarly affected. The symptoms are fairly well marked in this case. The muscles of the calves are greatly hypertrophied and hard to the feel. The other muscles of the legs are poorly developed, but there does not seem to be much atrophy, although there is great weakness in the muscles of the back and legs. He stands with his feet apart, and when walking his shoulders are drawn back, his abdomen is prominent, and there is considerable lordosis, and he throws his legs out from him, and walks with a somewhat swaying gait. He can't walk or jump, goes up stairs very slowly and

with the help of his hands, and can't go down stairs at all, simply sits down and slides. He rises from the floor in the manner characteristic of these cases, except that he does not climb up his thighs with his hands, but after getting to his knees he steadies himself for a minute and then with a sudden movement, he succeeds in straightening his back, and he gains the upright position. The grasp of his hand and his kicking power are poor. He can't carry heavy objects. In walking he extends his arms to act as a balance. When he sits down he does it all of a heap. The deltoid and infra-spinatus muscles are slightly hypertrophied and hard, but the latissumus dorsi and pectorals are atrophied, and consequently he is unable to fix the scapula on the thorax, and on lifting the boy by the shoulders they are raised so as to touch the side of the head and get pushed up towards the ears.

The knee jerks are very faint, and elicited with difficulty. The sensory functions are normal.

He is rapidly getting worse in regard to walking, and is very easily knocked over.

Skin is mottled over the thighs. Temperature subnormal. Mental condition satisfactory.

(*e*) Cases of ABDOMINAL TUBERCULOSIS.

He showed the present six cases of abdominal tuberculosis as a sort of protest against the growing belief that the correct treatment is to subject all such cases to laparotomy. He does not agree with this opinion at all, for he thinks that the cases of tuberculous disease of the abdomen which ought to be operated on are those in which a quantity of fluid is present in the peritoneal cavity. All these cases have been under treatment for periods varying from one to two years. When first seen they were all gradually falling off, losing strength and weight, with poor appetites, fever, and swinging temperature. Most of them had diarrhœa. The examination of the abdomen revealed swelling, resistance to palpation with rigidity, and the feeling of something solid inside as if the abdomen were packed with cotton wool. Under chloroform large tubercular masses were felt filling or partially filling the abdomen. Under treatment they have all gained weight varying from 8 lbs. to 1 stone, the fever, sweating and diarrhœa have ceased, and the appetite and general health much improved. An examination of the abdomen reveals in two of them complete disappearance,

and in two others great diminution of the tubercular masses and of the matting of the intestines which was previously felt. The resistance has gone, and the abdomens now feel soft and natural.

(*f*) Case of PSEUDO-LEUKÆMIC ANÆMIA.

Peter T., æt. 1½, was brought to the hospital last August because he was not thriving and becoming pale and thin. On examination he was found to be very rachitic. Complexion was pale and waxy, and the body was covered with small purpuric spots, and he had occasional attacks of epistaxis. On examining the abdomen, the spleen was found to be enormously enlarged, extending down to the iliac fossa. In front it reached the middle line, and posteriorly when the patient lay on his right side it extended to 2½ inches from the vertebral column. The anterior border was sharp, thin, and hard to the touch, and two notches were felt about 1¼ inches apart.

The liver also was enlarged, and extended 2½ inches below the costal margin; the diameter in right nipple lines was 5½ inches. No enlarged glands were felt anywhere. Red blood corpuscles 2,800,000; leucocytes, 9,800; hæmoglobin, 36 per cent.

Dr Fowler, who kindly examined the blood films, reported as follows:—Red blood corpuscles show moderate amount of poikilocytoses; nucleated reds fairly numerous. Nearly all normoblasts; only 1 megaloblast to 40 normoblasts. Many other nuclei show signs of division, and in such cells the protoplasm stains deeply.

Leucocytes, many of these are large lymphocytes,	70·25%
Polymorphonuclear,	25·25%
Myelocytes,	3·5%

The clinical condition of the child has in every respect improved since last summer, and the size of the liver and spleen have somewhat diminished; but Dr Fowler reports that there is no improvement in the condition of the blood, but that, on the contrary, there are fewer red blood corpuscles and more leucocytes than there were some months ago.

4. *Dr John Thomson* exhibited—

(*a*) A male infant, 7 weeks old, suffering from CONGENITAL HYPERTROPHY OF THE PYLORUS AND STOMACH-WALL. The pylorus had been stretched by Mr Stiles twelve

days before. The child had only vomited slightly on three occasions since the operation, and was taking his food well.

The main symptoms which had been present were those characteristic of the disease, namely :

1. The infant was quite healthy at birth, and continued so until the vomiting began.

2. Vomiting began soon after birth (in this case 2½ weeks), and it persisted in spite of all sorts of treatment carefully carried out.

3. The vomiting was unaccompanied by such usual symptoms of indigestion as diarrhœa, flatulent distension, etc., although there was, of course, emaciation and constipation, or, more correctly, abnormally small motions, due to the small amount of food that passed the pylorus.

4. Fluid, if not vomited, was retained for an unnatural time in the stomach. This could be demonstrated by giving 2 oz. of suitable fluid, after the stomach had been emptied by the stomach-tube, and passing the tube again in two hours. When this was done it was found that the stomach, instead of being empty by this time, still contained about 2 oz. of fluid.

5. In this, as in many previously observed cases, marked peristaltic waves were visible at times passing from left to right over the surface of the enlarged and hypertrophied stomach. The enlarged pylorus could also be felt as a hard tumour when the child was under chloroform.

The morbid anatomy of the condition was simple, as there was usually nothing of importance found except very great hypertrophy of the muscular tissue of the pylorus and stomach-wall. Photographs and microscopic specimens illustrating this were passed round.

The etiology was an obscure and much disputed subject.

Practically, the disease was an important one, because it was not very uncommon and not difficult to recognise by anyone who knew its symptoms ; also, because if well marked it was always fatal if not operated on, and now there was a reasonable hope of a permanent cure from operation.

During the last few years various operations had been tried. Pylorectomy had been successful in one case and gastro-enterostomy in, at least, two or three. The great majority of cases, however, in which these serious operations had been performed had ended fatally.

Two years ago Dr J. H. Nicoll, of Glasgow, had published a case in which the pylorus had been stretched with forceps. The child had recovered and was quite strong. Another case of this operation had been done successfully on the Continent by Schmidt. This was the operation which had been done in this case, with some modification, by Mr Stiles.

Mr Stiles performed Loreta's operation of stretching the pylorus. An incision was made in the middle line, midway between the ensiform cartilage and the umbilicus, and the pylorus, along with the adjacent part of the stomach, drawn out of the wound.

The stomach was then opened by a transverse incision, three-quarters of an inch in length, about an inch from the hypertrophied pylorus.

The canal of the pylorus, which just admitted a No. 6 bougie, was first dilated up to a No. 17 bougie, then with dressing forceps, and finally by means of a Lombarde's three-bladed tracheal dilator; the latter instrument was found to be particularly well adapted for the purpose. From the experience which Mr Stiles had had in a previous unsuccessful case, he thought it was a mistake to continue the dilatation until either the muscular or peritoneal coats were seen or felt to rupture. The wound in the stomach was closed in the usual way by a double row of fine silk sutures (continuous); the abdominal wound by interrupted sutures of silkworm-gut passing through the whole thickness of the abdominal wall.

(*b*) A rickety boy, æt. 3 years, with peculiar HYSTERICAL SYMPTOMS. He had a habit of constantly swaying his body forwards and backwards while sitting. When laid down he would rock his head from side to side in a curious slow, rhythmical way. These movements evidently caused him satisfaction, and while performing them he closed his eyes partially, and looked like a hypnotised person. There was no sign of masturbation. The child also showed to a considerable extent the symptom called "flexibilitas cerea," *i.e.*, when his limbs were raised and placed in any position, they had a tendency to retain it for a long time.

(*c*) Four cases of MONGOLIAN IMBECILITY, 19 months, 21 months, 9 years and 16 years of age respectively, which presented the usual features of this disease.

(*d*) A boy of 14½ years with ACHONDROPLASIA, also

skiagrams of his hands (by Dr Rainy), showing the very backward condition of their ossification and their characteristic conformation. This consisted in shortness of the fingers, unusual equality in length of the different digits, and a noticeable separation between the middle and ring finger.

(*e*) Two children, a brother and sister, with so-called CONGENITAL RICKETS. They were 6½ and 3¼ years old respectively, and their symptoms were remarkably alike.

At birth there had been in both cases extensive craniotabes and marked bending of all the long bones of the lower limbs. In each child there had been evidence of a badly united intra-uterine fracture of one of the femora. There was no enlargement of the epiphysial ends of the long bones such as is seen in achondroplasia, nor was there the disproportion between the length of the limbs and that of the body seen in that disease. Both children were very small indeed for their age. They had also a peculiar shape of head, pigeon-breast, and bendings on all the bones of the lower extremities. In both, also, the hands showed a curious deformity, which consisted in a bending of several of the fingers at their proximal joints, with an inability to straighten them. In both cases the intellect was rather above the average.

Skiagrams (by Dr Rainy) illustrating the condition of the bones of the lower limbs were also shown.

5. *Dr J. C. Dunlop* exhibited—

(*a*) Early case of MICROCEPHALY. A child, now ten weeks old, in whom microcephaly was diagnosed at the age of six weeks, the diagnosis was based on there being what was apparently complete synostosis, absence of fontanelle and absence of any movement under pressure of the cranial bones at the sutures. The head shows some of the ordinary signs of microcephaly, the low forehead, etc., but does not as yet show disproportionate enlargement of the face and ears. The cranial bones are fixed in a position of over-riding, the left parietal over-rides the right parietal, both parietals over-ride the frontal and occipital. The child has given evidence of being possessed of an acute sense of hearing, but has given no evidence of having any sense of sight. He has on several occasions had convulsions.

(*b*) A case of CONGENITAL HEART DISEASE, where the

diagnosis is an imperfection of the ventricular system, and where no subjective symptoms or interference with general nutrition exists.

(*c*) A case of MONGOLIAN IDIOCY complicated with rickets where the general nutrition and mental state of the child had improved under treatment by phosphorus.

6. *Dr J. S. Fowler* exhibited—

(*a*) A boy, aged 3 years, who suffered from so-called CONGENITAL RICKETS. The patient was born after a perfectly natural and easy labour, and was orginally seen on account of an apparently spontaneous fracture of the right femur which occurred on the third day of life. The child was well developed and quite healthy, and exhibited no signs of prematurity. The cranial bones, however, were very imperfectly ossified, the posterior part of the skull being almost entirely membranous. The fracture of the femur was not a green-stick, but was complete, with well-marked crepitus. It united well, though a considerable mass of callus was thrown out. The child throve well and showed no further sign of rickets; dentition began at the sixth month, and walking at about a year. The posterior fontanelle still existed as a space at the end of the first year. He suffered, however, from fragility of the bones, and sustained the following fractures after very trifling injuries:—left humerus at third month, right femur at eighteenth month, left humerus again at twenty-first month, and right humerus at twenty-fourth month, while during the third year he had broken the left humerus once, if not twice. Apart from the deformities caused by these fractures he was now healthy, but his growth was backward, his height being only 31½ in. (average = 35 in.). The condition corresponded with what has been described as "congenital rickets," but it was very doubtful whether it had any connection with that disease. It bore a certain resemblance to idiopathic fragilitas ossium, but lacked the markedly hereditary character of that condition. The fractures did not at all resemble those of rickets, but were all transverse and complete, not green-stick. It seemed probable that the disease was due to some imperfection in the function of the periosteum leading to incomplete deposit of bone, as shown by the well-marked craniotabes present at birth.

(*b*) A case of HEMIHYPERTROPHY in a girl, aged 3. A

description of this case had been published in the "Edinburgh Hospital Reports" for 1899, and since then the relative size of the halves of the body had remained unaltered. The hemihypertrophy was practically complete, affecting face, thorax, leg, and arm. As usual, the right side was the larger, and the distal parts more hypertrophied than the proximal. Numerous capillary nævi were scattered irregularly over the body, and the temperature was higher on the larger side. The eruption of the teeth began earlier on the right than on the left side.

(*c*) A case of RHEUMATOID ARTHRITIS in a girl, aged 13. The disease had lasted for about six years and the patient had been under treatment for about three. When she was first seen there were elastic globular swellings of all the joints of the arms, of the knee and ankle, and perhaps of the hips. There was little bony outgrowth, no pain, and but slight interference with movement. The lymphatic glands were generally enlarged, but the spleen was of normal size. Under treatment with arsenic, cod-liver oil, and iodide of potash, the joint condition had somewhat improved, though the sterno-clavicular and temporo-maxillary articulations had latterly become affected. There was now less synovial swelling, and more bony exostosis than at first, but notwithstanding the very evident deformity, the function of the joints was interfered with to a much less extent than might have been expected.

(*d*) A case of COMMENCING HYDROCEPHALUS SECONDARY TO BASAL MENINGITIS. The child was aged 14 months, and had had an attack of posterior basal meningitis about six months ago, which was characterised by the usual symptoms of fever, head retraction, blindness, and bulging of the anterior fontanelle. The acute symptoms had subsided, and vision was to a great extent recovered, but the child was becoming mentally impaired, and the head had recently begun to increase in size somewhat rapidly. Lumbar puncture having failed, aspiration of the ventricles was contemplated.

7. *Dr J. W. Simpson* exhibited two cases showing SYMPTOMS AND SIGNS OF EARLY RICKETS.

CASE I. Child (bottle fed), 4 months old, brought up to hospital suffering from convulsions. Had profuse head sweating at night, commencing rachitic rosary; large anterior fontanelle, and posterior fontanelle still open; also well marked

craniotabes over posterior part of parietal bones. The feeding of the child was very irregular, food given at any time, also deficiency in fat. The child was taken out very seldom.

CASE II. Child, 4½ months old (bottle fed), extremely restless at night, very constipated, slight beading of ribs, large anterior fontanelle and well-marked craniotabes. The feeding also showed deficiency in fat, and the hygienic conditions of the child were bad.

II. EXHIBITION OF SPECIMENS

Dr T. Burn-Murdoch exhibited photographs, casts and specimens, the most interesting of which was a specimen of an anuerism of the aorta in a boy of eight, who died suddenly, a very rare condition in childhood.

Meeting XI.—June 4, 1902

PROFESSOR T. R. FRASER, M.D., LL.D., *President, in the Chair*

I. EXHIBITION OF PATIENTS

1. *Dr G. A. Gibson* exhibited two cases of LOCOMOTOR ATAXIA presenting some unusual features—

(*a*) A man, aged 63, gardener. Admitted May 26, 1902, complaining of total blindness of left eye, and almost total blindness of right. Shooting pains in legs; constricting girdle pain at level of nipples.

Previous history.—Negative, no specific history admitted, but some suspicious scars were noted on the shins.

Present illness.—Dates six months back, with gradual onset of above symptoms. The patient

Shows following phenomena.—Pupils unequal: the left very small and neither reactive to light or accommodation. No nystagmus. Primary grey atrophy, advanced in left disc and marked in right. Knee jerks absent. No Romberg's symptom. Practically no inco - ordination. Fine muscular tremor (fibrillary) can be seen and felt in nearly all the muscles of the body, especially those of the chest, lower limbs, and jaw; much increased on tapping the muscle. No sensory phenomena whatever, other than ocular.

(*b*) A man, aged 41, pastry cook. Admitted May 15,

complaining of weakness of legs, inability to walk, dizziness, severe occipital headache.

Previous history negative, except for syphilis (very severe) in 1886. In August 1901 admitted to Royal Infirmary, Edinburgh, with symptoms similar to present. He left after four months, much improved.

Present phenomena.—Headache as above. Pupils equal: Normal reactions: ptosis of left lid and external strabismus of left eye (the former probably volitional, at least in part, and associated with diplopia). Diplopia in all directions. Fundi normal.

Tendon responses all absent. Some inco-ordination of all limbs. Patient cannot stand or walk.

The strabismus, ptosis and diplopia appeared the day after admission. Since then patient has had on several days very marked choreic movements of upper and lower limbs, varying very much from hour to hour. He has also shown some slight mental excitement.

2. *Mr F. M. Caird* exhibited a patient, aged 57, who had suffered for six or seven years from constant gnawing abdominal pain with severe attacks of colic. There were no definite abnormalities discovered on palpation, but the patient was so weak that he could only walk a short distance. He was greatly emaciated and anæmic. He weighed 11 st. 5 lb. in 1899, and 8 st. 13 lb. in April 1902. Tuberculous stricture was diagnosed, and on 18th April the abdomen was opened and two strictures were discovered, separated by a considerable interval of healthy gut. Both strictures were excised, together with the adjacent mesentery and infected glands, embracing in all an area of twelve inches. The patient now enjoys good health.

Preparations from the above case were shown. The higher stricture displayed the more marked proximal dilatation, with tuberculous deposits tending to form a fresh stricture. The lower stricture was markedly eccentric and was a good example of hyperplastic tuberculosis with a very narrow lumen.

3. *Dr William Elder* exhibited a case exhibiting CHOREIFORM MOVEMENTS (Paramyoclonus multiplex).

A youth, aged 19 years, had been suffering from choreiform

movements for more than five years. These movements first appeared when the patient was recovering from scarlet fever, and were noticed first about the nose and mouth, and shortly afterwards about the neck. About a year after their first appearance he began to make peculiar grunting noises, which were quite involuntary and are evidently due to contractions of the vocal cords and of the muscles of respiration. A year later these movements involved his arms and later still the legs.

The movements are not quite the same as in ordinary chorea—they are quicker, more rhythmical, and not quite so markedly grouped, although they are by no means limited to single muscles. They are also bilateral, although the right side is more affected than the left. In the limbs the movements seem greater in the muscles near the trunk than in the smaller muscles of the hands and feet. The effect of the movements on the face is frequently very marked, causing him to make grimaces. The angles of the mouth are sometimes jerked rapidly upwards, sometimes downwards, and the head is sometimes pulled and rotated to one side, sometimes to the other.

When he puts out his tongue he can hold it out fairly steadily, and it is only rarely that it jerks back involuntarily into his mouth. He can use his hands and arms fairly well, and seems to have almost complete control over them when he wishes to do anything.

He feeds himself with knife and fork quite well, and never lets fall crockery or anything breakable from his hands. There are only slight movements visible when he walks.

The grunting noises which he makes he can to a certain extent control, and his mother states that they are under his control when he is in church. When in hospital it was noticed that he could control his movements and noises pretty well in the ward, but he occasionally retired to the bath-room and made more noises there.

It thus appeared to be an effort to him to control his movements. When in bed and awake the movements were worse, but when asleep they were entirely absent. Mentally he seems all right, in fact, intellectually he is very bright; but there is one peculiarity about his cerebral functions. His mother states that he has a habit since the onset of his illness of using filthy and swearing language, which habit he seems unable to con-

trol. He states that he cannot prevent himself. When in hospital the nurse states that she never heard him use language of this sort, however.

The diagnosis lay between chronic chorea and paramyoclonus multiplex, the symptoms closely resembling those described in the latter disease. The history is interesting from the fact that it is just such a history as one might find in a case of chorea. His father is rheumatic; his sister died in childhood of weak heart; brother died of scarlet fever, which went to his head; and he himself suffers from rheumatic pains. The onset dates from an attack of scarlet fever. Dr Elder believes that paramyoclonus multiplex should be classified as a variety of chronic chorea, and the history of this case supports this view. Treatment has done no good.

4. *Mr Alexis Thomson* exhibited a patient after laparotomy for purulent peritonitis of gonorrhœal origin, and a second laparotomy ten weeks later for acute intestinal obstruction due to multiple bands.

The patient, a married woman, aged 30, was making a good recovery from her last confinement, five weeks before, when she was suddenly seized with abdominal pain and shivering. Her illness became progressively more serious, with the phenomena of general peritonitis. The temperature was 103·6° and the pulse 108. The abdomen scarcely moved with respiration and was considerably and irregularly distended. On the fifth day the belly was opened below the umbilicus; the coils of small intestine were greatly distended and were covered with purulent lymph. The changes were most marked in the pelvis, especially in relation to the left ovary and tube, the end of the latter being palpably patent. The ovary and tube were removed and the pelvis drained. Ten weeks after the first laparotomy, she was seized with symptoms of intestinal obstruction. After four days of pain and vomiting, the vomit being dark and foul smelling, and the abdomen much distended. Mr Thomson again saw her and advised operation. The old scar was opened up, and on exploration among the distended coils a number of bands were found constricting various loops. Only one of the bands required division between forceps and ligature; the others were broken across with the fingers. As the coil which had

been constricted by the strong band did not recover its tone, it was opened above the constriction groove and a large quantity of gas and fluid evacuated. The opening in the bowel was sutured and the belly wound entirely closed. The patient made a rapid recovery and has since gained considerably in weight.

II. Exhibition of Pathological Specimens

1. *Dr F. M. Graham* exhibited the base of a skull, showing complete absence of right lateral and sigmoid sinus. The inferior petrosal of that side larger than usual, as contained in internal jugular.

The left lateral and sigmoid sinus is very large, and the internal jugular in left side is also a very large one. The left posterior condylar foramen very large, probably carried off some of the blood from the sigmoid sinus of that side. There is no posterior condylar foramen in the right side.

2. *Dr Harvey Littlejohn* exhibited—

(*a*) Three specimens illustrating COMPRESSION OF THE BRAIN, as a result of fracture of the skull and rupture of the middle meningeal artery.

(*b*) Four specimens illustrative of the effect of prolonged immersion in water on the hands and feet.

(*c*) UTERUS, exhibiting the appearance in menstruation, prepared according to Kayserling's method.

(*d*) UTERUS, with superficial injuries, the result of external violence; abortion at fifth month; death of patient.

(*e*) Photographs of the body of a man after five months' immersion in the sea.

III. Original Communications.

1. HÆMORRHAGE INTO THE SPINAL CORD DURING PREGNANCY

By ALEXANDER BRUCE, M.A., M.D., F.R.C.P.Ed., F.R.S.E., Assistant Physician to the Royal Infirmary, Edinburgh; Lecturer on Practice of Medicine in Surgeons' Hall

THE rarity of hæmatomyelia as a primary affection has been recognised by the majority of writers on nervous diseases since the publication of the monograph of Hayem in 1872. That

author expressed the view that there is no such thing as a purely primary hæmorrhage into the spinal cord. He insisted that in all cases where the condition was not the direct result of injury—a view which had been expressed, although in a more tentative form, by Charcot two years previously—it was due to an acute myelitis.

The more recent work of Lépine (1900) has shown that this statement is too absolute, and requires to be modified. Lépine divides primary hæmatomyelias into those caused by traumatism, those produced by sudden removal of atmospheric pressure, and those which are spontaneous. Those cases in which the hæmorrhage has been definitely ascertained to be spontaneous are certainly few in number, and the majority of the cases quoted as primary hæmatomyelia, apart from those due to traumatism and the sudden removal of excessive atmospheric pressure (caisson disease), will not stand the test of critical examination.

Of 126 cases of hæmatomyelia (other than those due to caisson disease), in which post-mortem examinations were made, Lépine finds that 55 were traumatic, 26 were due to secondary causes, such as myelitis, softening and tumour; and that 45 were spontaneous.

Of the spontaneous forms 10 were due to passive congestion, 10 to ascertained vascular lesions, such as atheroma, fatty degeneration; 9 to blood diseases, and the remaining 16 to no appreciable cause.

Among the causes producing venous congestion are mentioned—lifting of heavy weights, straining at stool, whooping-cough, epileptic convulsions, strychnine poisoning, tetanus (in one case it is noteworthy that the hæmorrhage had occurred into a glioma which had previously been latent), arrest of menstruation, hæmorrhoidal lesions, the approach of parturition, various excesses, exposure to severe cold, mental shock, and working in a position calculated to cause stasis.

Among the blood diseases purpura, scurvy, and pernicious anæmia are mentioned, the last named disease being responsible for 7 out of 10 cases.

Among the vascular diseases atheroma is the most important, especially when associated with alcoholism. Miliary aneurism is practically non-existent. Thrombosis and syphilis are also causes, and there is also a vascular fragility leading

to no detectable change in the vessels and otherwise unexplained.

The following case is a striking example of the need for a careful and exhaustive examination of the hæmorrhagic area in any given case before the opinion is expressed that a hæmorrhage is or is not primary, as it well illustrates the ease with which one may overlook a grave organic lesion, the true source of the hæmorrhage, and which had given rise to no indication whatever of its presence during life. It is also of interest as showing that the criterion usually given as diagnostic of a primary hæmorrhage, namely, the absolute suddenness of the onset of symptoms, is one which cannot altogether be relied upon, even when fulminating hæmorrhagic myelitis and hæmorrhage into the membranes of the cord are excluded. It is also of further interest clinically from the effect which the hæmorrhage had in inducing premature labour, and in modifying the character of that labour, and from the light which it throws upon the nervous mechanism of parturition.

Mrs. M., aged 31, a hawker, was admitted to Ward 27 of the Royal Infirmary on 1st November 1901, and examined on the following day. She complained of paralysis of her lower limbs, and some weakness of her right arm. (The details of her family history need not be quoted, as they show no indication of any special hereditary tendency.) The patient's occupation necessitated her being much exposed to all weathers, as she had either to stand out-of-doors selling fruit, or to carry a heavy pack until she had earned sufficient money to pay for her food. She has had seven children, three of whom are alive, the others having died of whooping-cough, pneumonia, and one accidentally. She always suffered much during her pregnancies, with pain in the back during the first three months. She is now pregnant, and has vomited since the beginning, and lost much weight.

Present illness.—On Thursday, 31st October, about 9 A.M., during the act of vomiting, she felt something twist round and tear and give way on the right side at the level of the waist. She immediately fell on the floor, with intense pain shooting all over the body, and a sensation of severe vertigo. Her arms and legs shook spasmodically, and then, almost immediately, both legs and the right arm became paralysed. The paralysis of the right arm lasted only two hours. She was seen at 10.30

by Dr Hardie, of the Cowgate Dispensary. He found the arms very painful, but not paralysed. He gave her a hypodermic injection of morphia which relieved her considerably.

On Friday, 1st November, pain was felt all over the body, especially between the shoulders, and vomiting continued all day. Patient was admitted at 9 P.M. of the same day to the Infirmary, in a very collapsed condition and constantly retching.

On examination it was found that there was complete anæsthesia of the skin of the legs and trunk as high as a line beginning 2½ inches above the tip of the xyphisternum, and extending through the lower borders of the areola of the nipples to the level of the 7th dorsal spine. Her right hand and arm were still weak (she has always been left-handed, and the right hand has always been the weaker of the two), both legs and feet were œdematous. The left knee jerk was totally lost, the right was still present. There was no ankle-clonus. On both sides the plantar reflex was present, but very slight, with dorsiflexion of the toes. The pupils were small, and she was rather drowsy. She had not passed water since Thursday morning, and the bladder was greatly distended. After the urine had been withdrawn with a catheter the uterus was found to reach within 1½ inches of the umbilicus. She supposed that she was 5½ months pregnant. The bowels had not moved since Thursday morning. The anus was projecting somewhat, and the sphincter quite lax. On further examination it was found that there was complete loss of perception of touch, pain, and differences of temperature in the lower extremities and the trunk below the line already indicated. On the right side this line was fairly horizontal, but on the left it sank as low as the 12th rib (Fig. 1). There was no zone of hyperæsthesia above this line, but a definite area, 1½ inches broad, in which she sometimes said she felt, and at other times not. There was complete paralysis of voluntary move-

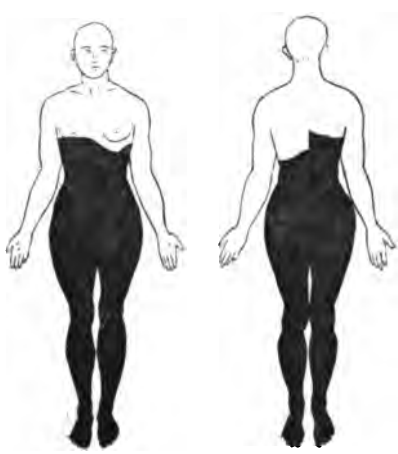


FIG. 1.
Area of Anæsthesia (black).

ment in both lower limbs, and in the abdominal muscles. There was profuse perspiration. Swallowing was normal, but the breathing was difficult owing to the great flatulent distension of the abdomen which was present. There was tenderness on percussion over the 6th and 7th dorsal spine.

Nov. 3.—Restless night. Vomited several times. Urine drawn off at 5 A.M. Some peptonised milk was given and retained. The superficial and deep reflexes remained as before. The area of anæsthesia unchanged. Slight tingling in the right arm. Stiffness and pain in the back and side of the neck and between the scapulæ. An enema given in the morning was returned unchanged. Half an ounce of castor oil given in the evening.

Nov. 4.—Upper limit of anæsthesia appeared slightly lower. The accuracy of this observation is doubtful owing to uncertainty of patient's answers. Much hiccough. Dyspnœa from upward displacement of diaphragm by flatus. Bowels moved unconsciously three times.

Nov. 5.—Retention of urine continues. Extreme gaseous distension of abdomen. Enema in morning was returned. Knee jerks now both absent. Plantar reflexes only to be elicited by strong stimulation—extensor response. An enema of asafœtida was ordered, and charcoal in teaspoonful doses relieved the abdominal distension. In the afternoon the patient complained of feeling very cold. Her skin was covered with a profuse clammy perspiration. There was great restlessness in the hands and arms, the tendons on the back of the hand constantly twitching. She complained of a feeling of electricity running down her arms, and also of a sensation of itching in the skin. Pulse extremely feeble, 120 per minute. Some whisky was administered in hot water.

Nov. 6.—Patient somewhat better. Had slept somewhat during night. Had vomited after taking castor oil. Muscular restlessness less. Retching continues, but patient can breathe more easily when propped up in bed. Pulse somewhat stronger. Knee reflexes quite gone. Albumen 1 gr. per oz.

Nov. 7.—General improvement. Breathing easier. Perspiration less. Right hand and arm still tingle. Pain between shoulders, but neck and left arm are better. Sickness stopped. P. 96. R. 24. Albumen as before. At night continuous hiccough. Thumb of left hand became adducted and drawn across palm twice, remaining rigid for a short time. P. 106.

Nov. 8.—Area of anæsthesia appears to have descended a little. Bed-sore developed over sacrum. Bowels still obstinately constipated.

Nov. 9.—Hiccough gone. Abdomen less distended. Vomiting gone. Slept better.

Nov. 10.—Slept well. Hiccough returned. Œdema of feet less. Bed-sore over sacrum increased in size.

Nov. 12.—Began to pass urine involuntarily. Hands weaker; unable to lift anything easily. Neck stiff on left side. Shoulder painful.

Nov. 13.—Both knee jerks have reappeared.

Nov. 14.—Hands very weak. Cannot shut either, or separate fingers, or flex or extend wrists. Cannot touch ring or little finger with thumb of either hand. Extension of wrist less impaired than flexion. Pupils react normally to light; are normal in size.

Nov. 15.—Both knee jerks distinctly present. These are readily exhausted on repeated tapping. Plantar reflexes present. Patient states that she occasionally feels a quiver down her legs like electricity. Hands somewhat stronger.

Nov. 17.—Improvement in hands continues. Area of anæsthesia noted to be slightly lower. On the inner side of both arms in front and behind, and just below the internal condyle, an area two inches long and half an inch broad, where patient cannot differentiate between heat and cold and pricking.

Nov. 17.—Another bed-sore over great trochanter.

Nov. 20-26.—Patient's condition remained much the same, with some cough and perspiration, and increase of œdema on legs and skin of abdomen. Plantar reflexes show dorsiflexion.

Nov. 27.—Fœtal movements felt (by the clinical clerk).

Nov. 28.—Patient's hands much recovered. Can touch little finger with thumb.

Dec. 1.—Bronchitis. Great difficulty in bringing up expectoration.

Dec. 1-7.—Bronchitis became more severe; caused great breathlessness, feeling of suffocation, and sleeplessness.

Dec. 11.—Temperature 103°. Cough worse. Much weaker, and very depressed.

Dec. 13.—30 mms. of nepenthe produced sleep and relieved cough.

Dec. 14.—About 4 A.M. this morning, when nurse had occasion to change the sheets, she noticed a gush of water coming from the vagina, and immediately summoned the house physician, Dr Wedderburn. On his arrival he found a fœtus born, all except the head. Patient had felt no pains, and was not aware that she was in labour until she was informed of the fact. A dose of ergotin was injected into the gluteal muscles. The head of the fœtus was delivered by Dr Wedderburn, who then found that the breech of another fœtus with the membranes intact was presenting. The uterus could be felt above the pubis firmly contracted as if empty—the fœtus probably

lying by this time in the vagina. It was expelled by suprapubic pressure, aided by traction from below. There was little or no hæmorrhage. Patient felt nothing, and did not aid expulsion by any voluntary effort. Both fœtuses were born dead. They appeared to be about the sixth or seventh month, and were well formed. The placenta came away intact with the second fœtus.

The genitalia were thoroughly sponged, and the vagina douched with weak corrosive solution. Special precautions were necessary owing to the fact that one sloughing bed-sore was present over the sacrum not far from the anus. The parts were powdered with boracic acid, and 30 minims of nepenthe given by the mouth.

Dec. 16.—Patient very well, considering her experiences. Can lie back in bed better now. Cough still troublesome.

Dec. 18.—Patient looks wearied; is not so cheerful as usual. Face more drawn and thin. Bed-sores becoming rapidly worse in spite of constant careful attention. Knee jerks and plantar reflexes could not be elicited. Slight involuntary jerkings of right thigh noticed.

Dec. 20.—Bronchitis worse. Expectoration profuse; brought up with great difficulty. Patient sits up and leans forward on her elbows. Cannot be persuaded to rest in any other position. Bed-sores threatening on the heels. Temperature has risen to 101°.

Dec. 28.—Patient very weak. Cannot breathe comfortably except when sitting up and leaning forward. In this position she supports herself on her elbows, and there are bed-sores developing on both; also on the heels. The temperature remains at 101°. Pulse very feeble. No difference in line of anæsthesia.

Jan. 3.—Gradually weaker. Frequent attacks of breathlessness, but on the whole the breathing is easier. Cough less troublesome. Bed-sores increasing in area and depth.

Jan. 6.—After a period of increasing feebleness, with mild delirium for several days, the patient gradually sank, and died about 1 P.M.

The post-mortem examination, which was limited to the spinal cord, revealed a high degree of thrombosis and dilatation of the vessels in the pia mater on the posterior aspect of the cord in the dorsal region. Throughout the whole of the dorsal region the cord was of a soft consistence, and somewhat darker in colour than normally. At one or two points in the upper dorsal and lower cervical regions what appeared to be a small extravasation of blood projected beneath the pia in the posterior columns. On section of the cord, after it had been hardened with 10 per cent. formaline, a tubular

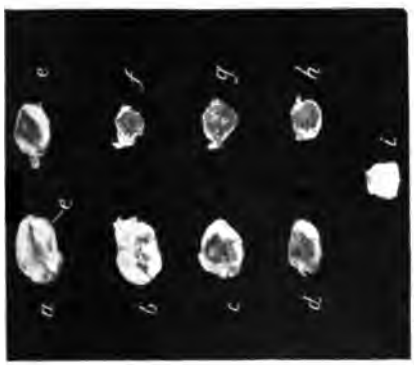


FIG. 1.

FIG. 2.

FIG. 3.

TO ILLUSTRATE DR BRUCE'S PAPER.

hæmorrhage was found throughout a great length of the cord, extending from the sixth cervical segment to the first lumbar, but presenting very different features at different levels. In the mid-dorsal region the hæmorrhage occupied nearly the whole of the interior of the cord, being covered merely by a thin layer of white matter. The hæmorrhage was of a rusty colour in parts. In the lower half of the dorsal region the hæmorrhage showed in its interior a peculiar tubular structure of small size, capable of admitting a fine pin. This structure was more or less circular in outline, had pale, somewhat thick walls, and it appeared to contain blood. This tubular structure persisted to the lower end of the dorsal region; but as successive sections were made from above downwards, the surrounding hæmorrhage gradually diminished, and disappeared at a higher level than this tubular structure itself. In the cervical and upper dorsal regions the hæmorrhage became somewhat rapidly lessened in size and limited entirely to the grey matter. In the upper dorsal and eighth cervical segments it occupied the anterior and posterior horns and the central grey matter, having somewhat the outline of a capital H. At the level of the 7th cervical the hæmorrhage became limited to the posterior cornua alone. At the 5th cervical segment, on the posterior aspect of the left side of the cord, a small tumour-like mass was found, which extended from the pia mater inwards, nearly to the central canal. It was independent of the hæmorrhage above described, was very vascular, and of a yellowish appearance in the centre (Plate I., Fig. 1).

On making microscopic sections at various levels the hæmorrhagic nature of the lesion was quite apparent. In the mid-dorsal region the tissue of the cord was almost completely, especially in its anterior portion, torn up by the hæmorrhage. The vessels which persisted were engorged with blood, and surrounded with numerous round cells. In the lower dorsal region the fine tubular structure already referred to became evident in the midst of the hæmorrhage. It was situated behind the central canal, for the most part in the anterior portion of the posterior column, partly in the mesial plane, partly somewhat to one side. The tube had walls of condensed neuroglial tissue, which were fairly vascular, being occupied by numerous small capillaries. An extensive series of sections failed to reveal any endothelial lining. At its upper extremity the tube became converted into a solid cord. It gradually passed forwards from the posterior column into one posterior cornu somewhat to one side of the mesial plane, and could be traced upwards until it came into contact with the neuroglia of the wall of the central canal. The lower end of the tube was also closed, but terminated in the posterior columns, and had no nearer relation to the central canal. The source of the hæmorrhage

into this tube was found in a rupture of its wall, and a communication with the hæmorrhagic area outside. A careful examination seemed to indicate that the hæmorrhage had arisen outside this tube, and had burst through its wall. In addition to this structure there was found in the mid-dorsal region two small angio-gliomatous masses, partly connected with the pia mater, and partly involving the white matter underneath. The vessels of this tumour were much dilated, and had very thin walls. Further, there were scattered throughout the cord, in parts near to, but not destroyed by, the hæmorrhage, several small areas in which the vessels were massed in close proximity to each other, but with very little other tissue between. These were evidently minute angio-gliomata. Similar masses also appeared to be situated in the midst of the hæmorrhage, where this had not so completely torn up the tissue. The source of the large tubular hæmorrhage appears to have been one or more of these very dilated vessels. The tumour in the fifth cervical region of the cord had a similar structure, but with much larger vessels—apparently dilated veins as well as dilated capillaries. This tumour had apparently begun to degenerate in its centre, but no hæmorrhage had taken place into it (Plates I. and II., Figs. 2 *et seq.*).

In the cerebellum there was a small angio-gliomatous tumour similar to that just described, and situated in the left lateral lobe.

With regard to the nature of the tubular structure found in the posterior columns, it appears certain that this was in no way formed out of the hæmorrhage, but that it anti-dated it, and was really due to mal-formation of the central canal, such as is found in hydromyelia. Such tubular structures are frequently found in spinal hæmorrhage, and they probably point to imperfect vascular development being the cause of the hæmorrhage.

Resumé of the principal symptoms in the case.—Onset at fifth month of pregnancy, during an act of vomiting, of sudden pain in the back and trunk, with paralysis of the lower limbs and trunk muscles, paralytic retention of urine, constipation, and great dyspnœa; sensation absolutely lost below xiphisternum; paralysis flaccid during rest of life; loss of left, persistence of right knee jerk; extensor response to tickling sole; disappearance of deep reflexes after six days and slight reappearance of them ten days later; slight temporary weakness of both hands; rapid formation of bed-sores; painless and unconscious birth of twins at seventh month; death from bronchitis and exhaustion.

We see from the comparison of the above with the post-

FIG. 5.

FIG. 7.

FIG. 4.

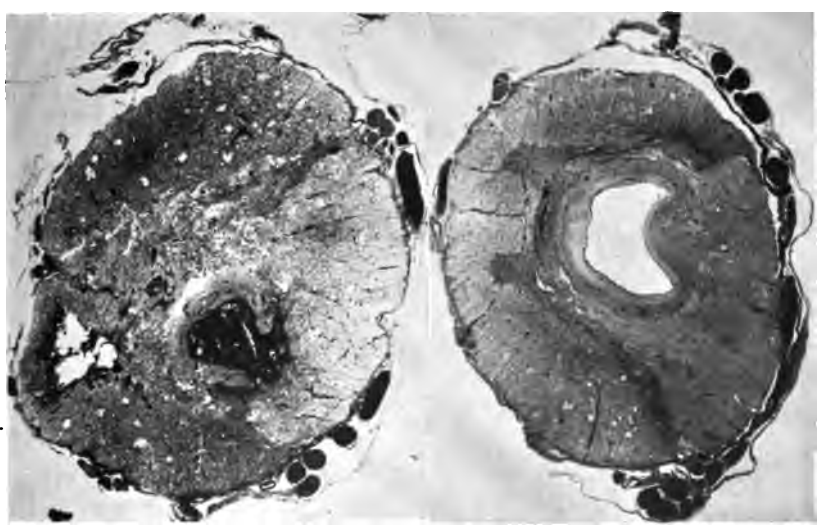


FIG. 6.

TO ILLUSTRATE DR BRUCE'S PAPER.

mortem appearances that the hæmorrhage was not primary, but was due to a lesion already existing in the cord, but one which had given rise to no symptom—apart from the sickness of her pregnancy the patient having complained of nothing. The site of the small tumours was such that the main motor and sensory paths were not interfered with materially, at least to a degree capable of attracting the attention of a perhaps not very observant patient. It was obvious that the dilatation and thinning of the walls of the vessels in the grey matter had developed to a considerable extent before the rupture came, and it will be seen also that in such an elongated hæmorrhage it would have been easy to overlook small neoplasms that were present in part of its length, and thus to regard the hæmorrhage as being spontaneous.

The nature of the paralysis and the deep and superficial reflexes is of interest. The paralysis of the muscles of the abdomen, the anus, and of the lower limbs was throughout of a flaccid nature, although the lumbo-sacral cord was beneath the level of the hæmorrhage. The plantar response was extensor (on one occasion doubtfully flexor), and although the cord was not completely cut across, the deep reflexes, within a week of the onset, disappeared for ten days and then reappeared, although they were very feeble. The temporary paralysis of the hand muscles was regarded as probably due to an upward extension of the hæmorrhage into the first dorsal and eighth cervical segment, and their recovery to absorption of part of the blood. It was interesting to note that the flexors were more paralysed than the extensors—a further support of the view that the flexor centre is lower than the extensor.

It was very remarkable how completely unconscious the labour was. The patient in no way voluntarily assisted in the process. She felt no pains, and was quite unaware of its occurrence until she was shown the fœtuses.

The occurrence of parturition in cases of anæsthesia and paraplegia is so rare that I may be allowed to refer to the paper of Dr Amand Routh, published in the *London Obstetrical Transactions* for 1897.

Dr Routh describes a case of a pregnant woman with paraplegia from injury to the dorsal region of the cord, in whom labour commenced at the normal period and progressed in an approximately normal manner, but without sensation of

pain, indeed almost without any sensation whatever. He refers to several similar cases.

Case 1, described by Ollivier in the *Traité de la Moelle Epinièré*, 2nd ed., 1827, p. 784, where a young woman of 22 was seized with complete paraplegia towards the end of her second pregnancy. Labour set in without warning and without pain. The woman was only made conscious of labour by the emptying of the abdomen and the cries of the child. She died ten days afterwards, and at the autopsy the spinal cord opposite the fourth dorsal vertebra was found compressed by hydatids.

Case 2, by Friedrich und Hermann Nasse (*Untersuchungen zur Physiologie und Pathologie*, Bonn, 1835, p. 268), in which complete paraplegia followed fracture at the level of the third and fourth dorsal vertebræ, with three days later a regular parturition without pain.

Case 3, Bernicke's. (Bernicke, Fritz, "Complication der Geburt mit Paraplegie und Anästhesie der unteren Korperhalfte," *Zeitschr. für Geburtshülfe und Gynäkologie*, Band 1, p. 28.) A woman of 28 with disease at the level of the seventh dorsal vertebra, followed by motor and sensory paraplegia as high as the umbilicus. Parturition was almost painless.

Case 4, Scanzoni's. (*Lehrbuch der Geburtshilfe*, Band III, p. 500, 1851.) Labour, almost normal, in a woman who had complete paraplegia, apparently from myelitis.

Case 5, Paget's. (Quoted by Sir James Simpson.) Paraplegia with loss of sensation and motion below umbilicus. Absence of reflexes. Labour at full time quite unconscious.

Case 6, Brachet's. (Brachet, *Recherches*, 2nd edit., Paris, 1837, pp. 199 and 313.) Apparently one of lesion in lumbar region. Loss of sensation as high as pubes. Labour began at full time, but the head merely entered the upper aperture of pelvis, and was only delivered with the aid of forceps.

Dr Routh's conclusions from these cases are that if the lesion is in the lumbar region the uterus may begin the labour automatically, but that it cannot complete it; that if the lesion is above the lumbar region the act can be completed, thus showing that the reflex mechanism in the lumbo-sacral region is sufficient of itself without any voluntary assistance. The case here recorded supports the latter of these conclusions. It also shows that the sensory path from the uterus enters

the cord in the lumbo-sacral (or possibly in the lower dorsal) region.

DESCRIPTION OF FIGURES.

Fig. 1. Sections of cord at various levels to show the distribution of the hæmorrhage; and one of the angiogliomatous tumours.
(*a*) Fifth cervical segment, showing tumour (*t*).
(*b*) Seventh cervical segment, with hæmorrhage in both posterior cornua.
(*c*) First dorsal segment showing the hæmorrhage in and around the grey matter.
(*d*) Second and (*e*) third dorsal segments, showing hæmorrhage.
(*f*) Fourth dorsal segment showing hæmorrhage occupying almost the whole of the transverse section of the cord.
(*g*) Sixth segment showing hæmorrhage, with the enclosed tube (the white ring) itself containing blood.
(*h*) Eighth dorsal segment, with clot.
(*i*) Second lumbar segment free from hæmorrhage.

Fig. 2. Angioglioma from posterior columns of fifth cervical segment (fig. 1, *a*). Empty spaces are dilated vessels.

Fig. 3. Fourth dorsal segment, showing the cord torn up by the hæmorrhage, vessels filled with thrombi in the substance and in the membranes of the cord. The oval laminated area to the left of the middle line is the upper end of the tubular structure found in the lower dorsal region.

Fig. 4. Sixth dorsal segment. Grey matter, especially anterior cornua on left side torn up by hæmorrhage. Tubular structure ruptured and being entered by hæmorrhage.

Fig. 5. Ninth dorsal segment with two angiogliomata in membranes. Dilated tubule (from which blood has been washed out) behind the central canal.

Fig. 6. Tenth dorsal segment, showing the dilated tubular structure with its thickened walls, situated in the anterior part of the posterior columns and immediately behind the central canal.

Fig. 7. First lumbar segment, showing the closed lower end of the tube in the front part of the posterior columns, slightly to one side of the middle line.

2. INTRA-PERITONEAL RUPTURE OF THE BLADDER—NOTES OF TWO CASES, ONE OF WHICH RECOVERED AFTER SUTURE

By J. SHAW M'LAREN, M.B., F.R.C.S.Ed., Assistant Surgeon, Royal Infirmary, Edinburgh

Comparative rarity of the accident,

INTRA-PERITONEAL rupture of the bladder is a comparatively rare accident. The fullest and ablest discussion of it is found in Max Bartel's work and in Rivington's monograph published in 1884; the latter, who includes Bartel's cases, was able to record only about 190 cases in all. But recovery from the

accident is a still rarer event. When Rivington's book appeared, he could admit but one genuine case of recovery. Alexander of New York published a paper on the subject last year, and after an investigation which seems to have been thorough, he gives a list of twenty-three recoveries, in all of which, of course, the bladder was sutured.

and of recovery.

No subject could better illustrate the gigantic stride of modern surgery. Rivington's treatise appeared only eighteen years ago, and yet apparently he required no special candour to write as follows regarding his treatment of a case which he had diagnosed as rupture of the bladder:—"These were the main local symptoms when I saw the patient with Mr Chambers on the Thursday evening, and we were both of opinion that they indicated injury to the bladder. . . . On the following day I found the patient decidedly worse, and we informed his friends that he was in great danger, and would probably succumb in forty-eight hours." And the surgeon allowed himself no further exercise of his skill than thus to indicate a term to his patient's life. This case, of course, occurred about thirty years ago, though, as I said, the author was writing not twenty years back; and at the end of the treatise he expresses the opinion that "surgery will achieve no unimportant triumph when occasional and indubitable recoveries are insured by improved methods of treatment." Syme in his day wrote: "If the rupture takes place above or within the reflection of the peritoneum, there cannot be the slightest chance of escape"; and Sir Henry Thompson in 1883, "In any case a recovery has never been known to happen, and can scarcely be regarded as possible." Our own John Duncan in 1886—and he was no timid surgeon—even when he diagnosed a rupture of the bladder, refrained from opening the peritoneum, and ventured only so far as to make a perineal incision, and through it to search the cavity of the bladder for the suspected rupture. He failed to find it, and the patient died. Three years after Thompson wrote, Macormac published two successful cases of suture, the first two recorded.

Striking advance in modern treatment.

The causes of rupture of the bladder are too well known to need detailing here. Blows on the abdomen containing a distended bladder, the crushing of a cart-wheel, falls from a height, etc., are common

Chief causes.

causes. I was interested in the cause of the rupture in my second case, for it occurs apparently more rarely than any other, a simple fall on the abdomen, not from a height at all, but while the patient is standing or walking on the ground. Rivington's first patient met with just such a simple accident, falling flat on his belly on the pavement on the way home from a house where he had been dining out; while in my case the man fell in the same way while ascending a stair. I have spoken of the distended bladder, and Rivington insists with much persistence that the accident cannot occur but to a fully distended bladder—that is, of course, when the pelvis is not broken—and this view is generally accepted. I cannot say that I think this proved; several cases seem to throw doubt on it, notably one the record of which states that a man was thrown from a dogcart and sustained a rupture of the bladder half an hour after he had emptied it. This he was certain of, and even though he had been drinking fairly freely, alcohol is scarcely capable of so pronounced a diuresis as to fill the bladder to distension in half an hour. It must, however, be remembered that the "tone" of the bladder varies apparently at different times; in certain circumstances the demand for urination is urgent though the bladder contains only a small quantity of fluid, while at another time it may have collected a larger quantity, and yet its walls are lax enough to require further distension before micturition is called for. In fact—if we are to judge from our sensations—the bladder walls seem sometimes to be more tightly stretched over a small quantity of fluid than over a larger quantity (this seems to be Michael Forster's view), and on such occasions perhaps a rupture might occur more easily.

Is a distended bladder essential?

The rent is usually vertical—in only 8 out of 110 cases was it transverse—and there is one site for the rupture which is far more frequent than any other, viz., the posterior superior aspect of the bladder. Rivington explains this by pointing to the fact that the lower part of the bladder is supported by the pelvis at the sides and the front, while the upper and back part of a distended bladder is surrounded only by yielding intestines; to this part of the organ the fluid in a bladder which has received a blow will be driven, and the urine will be

Why is the rent vertical and at the upper part of the bladder?

forced through the least supported part. Alexander, in the paper referred to, dismisses this view without discussion; he holds, with others, that the bladder is driven up against the promontory of the sacrum and ruptures at this point. It is difficult for anyone who studies a frozen section of the abdomen to understand how such contact could take place, and, even if it did, how the transverse projection of the bone should produce in almost every case a vertical rent. It is possible that the disposition of the muscular fibres of the bladder wall has not been sufficiently considered in this regard. They are usually correctly described as consisting of three layers, and while two of them are disposed longitudinally, only one is circular in arrangement. The middle circular layer is not the strongest; its upper fibres tend also to assume the longitudinal direction, and, in fact, the circular fibres are strong only in the lower, and especially the extra-peritoneal, portion. In other words, the upper and back part of the bladder wall may be considered as consisting mainly of longitudinal fibres, and pressure on the contained urine would tend to drive it through the wall between these strands. If Rivington is correct, as I think he is, in considering this part of the bladder as the least supported, and if there is anything in the suggestion with regard to the arrangement of the muscular fibres, the situation and the direction of the rupture may thus both be explained.

Disposition of the muscular fibres of the bladder.

It is needless, of course, to discuss fully the well-known symptoms of this accident. Shock, vomiting, inability to stand, hypogastric pain, urgent desire to urinate, with failure in the attempt, bloody urine, and certain peculiarities of catheterisation are usually cited as characteristic symptoms. Shock was certainly not a prominent symptom in my first case; and, of course, in many of the recorded cases it was conspicuously absent. In some cases the patient is able to stand, but in few, I think, will it be found that he is able to stand *upright*. It must be remembered that an urgent desire to urinate may be wanting in the early stages on account of alcoholic intoxication, and in the later on account of uræmic intoxication. Pain and tenderness in the hypogastric region I regard as extremely important symptoms; I found them present in all the cases of rupture of the bladder

Main symptoms.

I have met with, intra-peritoneal and extra-peritoneal. In one case in which the pelvis was broken, but in which the front of the abdomen had not been bruised, it was, of course, of special value. What I mean is the presence of the symptom is important; its absence must not mislead. It is not, perhaps, easy to account for a symptom which was specially marked in the first case I saw, the presence of a distinct hypogastric tumour in the middle line and to the left of it, tender, of course, and distinctly dull on percussion. From this region, when the peritoneum was opened at the operation, bloody urine gushed forth; but it is difficult to understand why in such cases the fluid seems to collect above the bladder instead of dissipating itself in the lowest levels of the pelvis and flanks.

One symptom which I have never seen recorded was related by the first patient I treated. He asserted that as the cart (see note of the case) passed over his abdomen, urine squirted from his penis. I can find no record of that anywhere.

"Bloody Anuria" the chief symptom.

But the chief symptom remains to be mentioned. The patient, as I said, may or may not suffer from a distressing call to urinate, but, on making the attempt, he fails altogether, or voids but a few drops of bloody urine, and when the catheter is passed the picture is the same—a spoonful of bloody urine. Rose, of Berlin, who has a most interesting paper on these cases, has coined an admirable phrase for this symptom, in the term "*blutige Anurie.*" This "bloody anuria" is most striking and characteristic; occurring after an injury to the abdomen it almost suffices for a diagnosis. Rose's phrase is a very happy one, and seems to please the German professor himself, for he presents it now and again with evident favour; and one is grateful for a striking phrase to fit a striking symptom.

The peculiarities of catheterisation are well known. The instrument draws off, as has been said, a few drops of bloody urine, and finds itself in a contracted bladder, which permits no movement of its point, or it—on rare occasions only, I think—passes through the rent in the bladder into the peritoneal cavity. In such a case it may give exit, especially at the later stages, to large quantities of urine almost or quite free of blood.

The injection test *may* help.

The injection and inflation tests are intended to aid the diagnosis. The former consists in injecting into the bladder a considerable quantity of fluid, accurately measured; should it all return through the catheter, the bladder is whole; should only some of it return, there is a rupture of the bladder, through which some of the fluid has escaped into the peritoneal cavity, where it remains. Now, is this a valuable aid to diagnosis? I think not. That is to say, when only some of the fluid returns one can be certain that there is a rent in the bladder; but when all the fluid returns, one cannot be certain there is *not* a rent in the bladder. Both in intraperitoneal and extraperitoneal ruptures (it occurred in a case of my own) the test has failed—that is to say, all the fluid was returned, though the rent was there. The test has a "positive value" only, so to speak, but the practice of it can do no harm; only excessive reliance on it may deceive.

The inflation test condemned.

The inflation test consists in mapping out the liver dulness, and then injecting air into the bladder; the air will escape through the rent and obliterate the liver dulness. The test is unreliable when the intestine is distended, and it is always dangerous, as it has been known to produce alarming shock. The practice of it should be abandoned.

Cases difficult of diagnosis.

Now and again cases difficult of diagnosis are met with. Such are those in which the history states that the patient was able to walk a considerable distance after the accident, that he passed only a little blood, and that he continued comparatively well for days, either urinating successfully or passing large quantities of urine through a catheter. An extraordinary case of this kind—but extra-peritoneal—is recorded by Dr E. T. Bennett. A drunken sailor, who had received a blow on the abdomen, was admitted to hospital in a state of collapse, which soon passed off. He attempted to urinate, and passed about two ounces of bloody urine. Half an hour later he passed more than a pint of blood-stained urine, and continued to urinate normally for days. Six days after the accident a hypogastric tumour appeared, and in the second week the urine became fetid. On a catheter being used to irrigate the bladder, it was discovered that the instrument could be passed

into a cavity beyond that in which it first rested, and that fluid could be injected into this so as to distend it, and could be evacuated from it by pressure. Only then was a rupture of the bladder suspected. The patient survived for five weeks; he had been up and about the ward, and had taken his meals well till near the end. At the sectio a huge cavity was found in the pelvis filled with urine and communicating with a rent in the anterior wall of the bladder. The chief difficulty of a correct diagnosis here was, of course, the power of seemingly normal micturition; as far as I can see, such a power, as might be expected, is indeed very rarely retained by the subject of a ruptured bladder. But it is to be noted that even in this case, at the outset, the chief diagnostic symptom, bloody anuria, was present, though I admit that afterwards it was wanting. I think it will be found in almost every case, at least in the beginning, and it is the chief support of the diagnosis of ruptured bladder, intraperitoneal or extraperitoneal. In conjunction with injury to the lower part of the abdomen it should suffice—or, shall I say, *almost* suffice? In my second case it was enough for me—I declined the injection test. It was enough that the patient had fallen on his abdomen, that he could not urinate but a few drops, and that the answer even to the catheter was, "bloody anuria." The symptom might possibly seem to point to one of two other injuries, contusion of the kidneys and rupture of the urethra. But in a case of injured kidneys, the bloody urine is normal in amount, and the patient exhibits great tenderness on pressure in the loin; while in a case of rupture of the urethra there is a spontaneous flow of blood from the urethra, or drops of blood succeed each other at the meatus, and if the urine is retained, it distends the bladder in an easily recognisable fashion. Such symptoms are absent in a case of ruptured bladder.

Causes of death; peritonitis and uræmia.

The cause of death after rupture of the bladder is either peritonitis or uræmic intoxication. Why should septic peritonitis arise? In the numerous experiments made on animals it has been abundantly proved that aseptic urine can be introduced into the peritoneal cavity or allowed to flow into it from the ureter or bladder without injury to the peritoneum. Should septic urine escape from a ruptured bladder, acute peritonitis will naturally follow at once. But in many cases

where peritonitis was the cause of death, the urine was normal.

Why septic peritonitis?

It is well known, of course, that organisms can pass through the intestinal wall even though it is unruptured provided the tissues of the wall are damaged. It is possible that the bruising of the intestines which must result from the application of a force severe enough to rupture the bladder permits the passage of organisms through their walls and thereby the infection of the extravasated urine. In some cases uræmic intoxication is the cause of death. In experiments made on dogs it was found that urine might flow from a divided ureter into the peritoneum without injury to the animal's health, provided it was permitted to drain away; if, on the other hand, no escape were provided for it, it was absorbed by the peritoneum and produced uræmic intoxication. Rose mentions a case in which the patient, a young boy, showed marked symptoms of uræmia following intraperitoneal rupture of the bladder; he recovered after laparotomy and drainage without suture of the rent.

Suture of the bladder almost invariably the correct treatment.

More than one hundred years ago Benjamin Bell proposed suture of the bladder for rupture. Nearly one hundred years ago Blundell of Guy's Hospital wrote, "Should the bladder give way in the peritoneal sack, why should we not lay open the abdomen, tie up the bladder, discharge the urine, and wash out the peritoneum thoroughly by an injection of warm water?" Why not indeed? But no one made the attempt till first Mr Willett and then Mr Heath performed the operation, both unsuccessfully. Shortly afterwards Macormac published his two cases. With the exception of a few cases, those in which special circumstances forbid it, the treatment consists in opening the peritoneal cavity as soon as the diagnosis is made, and suturing the rent in the bladder wall. Three points still arouse a certain amount of discussion.

Three points still under discussion.

First, should the mucous membrane be sutured, as well as the other layers? Most surgeons have contented themselves with one, or two rows of Lembert sutures passed through the muscular and peritoneal coats. In my first case, which recovered, I sutured the mucous membrane first, and then inserted two rows of Lembert sutures outside it; amongst the recorded cases I find

only one—a case of Miculicz—where the surgeon sutured the mucous membrane. Catgut, of course, should be used for it, that no threads may remain to disturb the smoothness of the lining of the bladder. It is difficult not to feel that closing the mucous membrane gives additional security, but, as a matter of fact, almost all the cases that have recovered were as I have indicated, sutured only through the outer layers. The second point concerns drainage of the peritoneum. There has been some discussion regarding it, but the question will always be much a matter of individual temperament and experience. Except in a few rare cases when the patient's condition is very good, and laparotomy is performed almost immediately after the injury, I think a tube should always be left in the pouch of Douglas; it should not be forgotten that one is dealing with a damaged peritoneum and bruised viscera. A third point on which there is some difference of opinion is the practice of tying in a catheter at the end of the operation to prevent leakage while the sutured rent is healing. From a study of the recorded cases I incline to think that no instrument should be tied in, but that a catheter should be passed once every two to four hours for the first day or two days. In every case one should be passed at the end of the operation, and the surgeon may often be able to satisfy himself how well his suturing has closed the rent; in one case at the close of the operation I drew off 4 oz., and in the other nearly 10 oz. of blood-stained urine. I append a few short notes of the two cases I have treated.

Notes of two cases.

W. F., age 33, vanman, admitted to the Royal Infirmary, Edinburgh, on June 6th, 1901. About 4 P.M. fell off his van, which passed over the lower part of his abdomen. Had urinated two hours previously. Was slightly intoxicated. Was asked to pass water, but failed; stated that, as the cart passed over his belly, urine squirted from his penis. Dr Fleming, the house surgeon, passed a rubber catheter easily, and drew off four ounces of bright red bloody urine. He suspected rupture of the bladder. I saw the patient three hours after the accident. No collapse. Abdominal respiratory movement chiefly in the upper part of the abdomen. Swelling in the right part of the hypogastric and umbilical region, markedly tender on pressure, dull on percussion, but no appearance as of a greatly distended

bladder. Injected 12 oz. of hot sterile water; half of it returned in a feeble stream, ebbing with the expiratory movement in a marked fashion. No fracture of the pelvis. Incision above the pubes; no extraperitoneal rupture. Enlarged the incision upwards, and opened the peritoneum; bloody urine gushed out. Found a vertical, fairly clean-cut rent 3 to 4 inches long in the posterior superior surface of the bladder. Stitched the mucous membrane separately, and inserted two rows of Lembert sutures over it. Prolonged washing of the peritoneal cavity with hot saline. One drainage-tube in the peritoneum and one behind the pubes. At the close of the operation drew off 4 oz. of bloody urine. At midnight pulse 84, temperature sub-normal. Next evening temperature 101°, the highest point reached. Catheter every two hours at first, then every four hours. Slight suppuration at lower angle of wound delayed union of abdominal wall. Made a complete recovery.

T. L., age 45, tailor, admitted to Royal Infirmary, Edinburgh, April 22nd, 1902. At 10 P.M., the day before, intoxicated, ascending the steps from the Waverley Station, fell on his belly. Unable to stand upright. Suffered severe pain, and conveyed home in a cab. Had urinated four hours before the accident. Subsequently passed no water at all. Suffered much all that night and the next day. On admission, great distress, pulse 120, temperature 99·8°, respiration 36. Slight swelling above pubes, dull on percussion, tender on pressure, dulness in flanks, but no appearance as of a distended bladder. Dr Wood, the house surgeon, passed a rubber catheter easily, and drew off a little pure blood. He suspected rupture of the bladder, and sent for me. I found patient in the condition described. Considered it needless to try the injection test; the history of the accident and the bloody anuria were enough. Ascertained patient had been drinking for weeks before the accident. Same incision as in first case, to ascertain whether there was an extraperitoneal rupture; none found. Opened the peritoneum; bloody urine gushed out, and vast quantities of blood-clot were removed. Very ragged rent 3 inches long on posterior superior surface of bladder, running somewhat transversely to right side and then backwards. One row of Lembert sutures inserted with great difficulty. Peritoneum washed out with hot saline. Patient almost hopelessly collapsed. Assistant injected about five pints of hot saline into

the median basilic vein during the later stages. At the close of the operation nearly 10 oz. of bloody urine drawn off by catheter. Injection of saline had admirable effect. Catheter every two to three hours at first. In two days was urinating spontaneously without catheter, though that was still used. Three days after the operation felt quite well and cheerful, and wanted to smoke. Urine normal. Next day restless, signs of delirium tremens appeared, and gradually increased. Died with slight signs of peritonitis six days after the operation, seven days after the accident. Sectio: pelvic peritonitis. Bladder distended well when injected, but when full allowed a slight leakage at the posterior sutures. Dr Beattie reports no signs of necrosis in edges of rent. So I fear I must attribute the fatal issue partly at least to failure in overcoming the great difficulties in the way of accurate suturing, though perhaps it is not unreasonable to cherish the belief that had he not been a confirmed alcoholic, a patient who was so well, and who retained and expelled his urine so normally three days after the operation, would have recovered.

Alexander's list shows that nearly 50 per cent. of the cases operated on for suture recovered, an indication that recoveries after the accident are not to be such rare events as formerly, now that the correct treatment is understood. As I said, twenty-three recoveries are recorded, and my case would make the twenty-fourth; but I may have missed the record of a published case, and probably some surgeons may have had successful cases which have not yet been made public.

MEETING XII.—July 2, 1902

PROFESSOR SIR T. R. FRASER, M.D., LL.D., *President, in the Chair*

Before commencing the business of the meeting, Dr T. S. Clouston, in the name of the Society, congratulated the President on his receiving the honour of Knighthood from His Majesty.

A letter was read from Professor Huchard, of Paris, thanking the Society for having elected him a Corresponding Member of the Society.

I. Exhibition of Patients

1. *Dr Chalmers Watson* exhibited a case of LUPUS VULGARIS under treatment with Myelocene; also a series of photographs of two cases of extensive psoriasis, treated with the same remedy applied to a limited area.

II. Exhibition of Pathological Specimens

1. *Dr Robert Purves* exhibited—

(*a*) RUPTURE OF THE FEMORAL ARTERY. The patient's leg was caught in the bight of a cable that was being paid out over the side of a ship. The cable cut through the soft textures on the inner side of the thigh, scraping off the periosteum, and scoring the bone.

The femoral artery was rubbed through at the entrance to the popliteal space. The ends of the vessel were completely occluded, and were separated by an interval of about one inch. There was but little hæmorrhage. The vein and nerve were uninjured. The limb was amputated by Mr Annandale on account of the onset of gangrene. The patient made a good recovery.

(*b*) Sections showing the deposit of iron in the tissues in the vicinity of a fragment of steel lodged in the forearm. Section (a) stained with hæamatoxylin and eosin. Iron shows black. Section (b) stained with 1 per cent. iron, free hydrochloric acid, and 1 per cent. potassium ferrocyanide—the iron showing blue.

2. *Mr Alexis Thomson* exhibited—

(*a*) The CALVARIA of a man, aged 64, who twenty years before had sustained a compound depressed fracture of the skull from the kick of a horse. The depression was not remedied by operation. During the last ten years of his life he was subject to attacks of recurrent mania.

(*b*) The intestines from a girl, aged 17, showing strangulation by a band, apparently arising from an antecedent tuberculous peritonitis.

III. Original Communications

1. ON THE FALLACIES OF THE COPPER REDUCTION TEST FOR SUGAR IN THE URINE

By Francis D. Boyd, C.M.G., M.D., F.R.C.P.Ed., Assistant Physician, Royal Infirmary; Physician, Deaconess Hospital, Edinburgh

Most physicians who examine candidates for life assurance are familiar with the nervous individual who dreads medical examination and "bucks" himself up for the ordeal with a pint of champagne, thus producing a transitory or alimentary glycosuria. It is not with such conditions that this paper is intended to deal, but rather with the substances apart from glucose which though they may have no known pathological significance have the power on the application of Trammer's or Fehling's test, of dissolving copper hydroxide and of reducing copper hydroxide forming the red suboxide. A number of urines of this class have come under my notice, and it appeared of interest to define the limit of power of some of the different substances capable of producing error, and to determine the limit of probability of fallacy in the test for sugar as carried out by the ordinary method with Fehling's solution. Two cubic centimetres of Fehling's solution was taken as an average quantity used in the routine application of the test. It was titrated with solutions of the different substances of known strength, the points when reduction appeared and when reduction was complete were noted. Complete reduction was checked by filtering the fluid and testing with acetic acid and ferrocyanide.

The substances which occur in the urine, and will produce copper reduction apart from glucose, are the glycuronic compounds, uric acid, kreatinine, pyrocatechin, and hydrochinon.

Glycuronic compounds are found in the urine in apparent health; after administration of various drugs of the aromatic series, such as camphor, naphthol, turpentinol, menthol, morphia, etc.; in infectious conditions such as typhoid fever, general sepsis, tonsillitis, etc. It is generally supposed that under such conditions the formation and excretion of glycuronic compounds is an effort on the part of the organism to protect itself from poisoning by the aromatic bodies, the poison uniting with glycuronic acid and being excreted as an aromatic glycuronic compound which is nearly or wholly inocuous. These glycuronic compounds are, of the different substances, the most likely to give rise to error in the application of the copper reduction test to urine. But given a urine which reduces copper, how are we to recognise that the reduction is not due

to glucose but to a glycuronic compound? Ashdown (1) formerly described a method for separation and estimation of these bodies, but it is now abandoned for the benzo-chloride method. For recognition of the presence of comparatively small quantities, Neuberg (2) has introduced the phenyl-hydrazin-bromide test. From Mayer's (3) observations the phenyl-hydrazin test, as conducted for glucose, does not give satisfactory results with glycuronic acid. A urine which contains glycuronic compounds will reduce copper and bismuth in alkaline solutions but will not undergo fermentation if treated with yeast. On treating the urine with hydrochloric acid and orcin or phloroglucin, a beautiful colour reaction is produced, a brilliant red passing into reddish-blue, followed by the deposition of a blue-green precipitate, which on the addition of alcohol, dissolves, giving a greenish-blue colour. A urine containing glycuronic acid is levorotatory, and with the spectroscope gives absorption bands between C and D extending close to, and at times up to, D.

The importance of the recognition of the glycuronic compounds in the urine is well exemplified by the following case. The urine of a gentleman was submitted to me for an opinion. The subject was a healthy man in middle life. He was desirous of increasing his life assurance policy in order to become a director of one of the large Edinburgh companies, but when examined he was rejected on the ground that his urine contained sugar. Several samples were sent to me, and all had much the same characters. The urine was clear and of a normal specific gravity. With the copper and bismuth tests there was decided reduction. The fermentation test proved negative, and no crystalline osazon was obtained with phenyl-hydrazin. The orcin and phenyl-hydrazin-bromide tests had not then been described, but I was able to satisfy the medical officer that the copper reducing substance was a non-fermentable carbo-hydrate — a glycuronic compound. The life was accepted, and the applicant is still, after eight years, in excellent health.

Most of us are familiar with the green colour which at times appears in the application of Fehling's test to the urine. Such a discoloration is produced by the presence of kreatinine, a body which is always mentioned in the text-books as a fallacy in the copper reduction test. Kreatinine in the urine may be demonstrated by the nitro-prusside test. It is derived from the kreatine of the food, and the amount present in the urine varies in health with the amount of kreatine ingested. Its power of reducing copper in alkaline solutions is not great. The copper in 2 c.c. Fehling's solution is reduced by 0.07 grm. kreatinine. Normally, urine contains about 1 grm. kreatinine in 1·500 c.c. 1·5 c.c. urine will therefore contain 0·0001 grm. Kreatinine can therefore be excluded under ordinary circumstances; if present

in excess it may give a change of colour, but will produce no definite copper reduction.

Uric acid is present in the urine in a proportion far in excess of the amount soluble in an equal quantity of water. A solution of uric acid in pipyridin was used in making observations and the results checked with a simple solution of pipyridin. With 2 c.c. Fehling, 0·017 grm. uric acid gave a decided reduction, while 0·03 grm. gave complete reduction. If we take the uric acid excretion in the urine as 1 grm. in twenty-four hours, an amount above the normal, then 1·5 c.c. will contain 0·0001 grm. uric acid, a quantity too small to produce any appreciable reduction in 2 c.c. Fehling's solution. Uric acid may therefore be excluded as a fallacy of the copper reduction test unless present in excessive amount in a highly concentrated urine, and even then the fallacy is improbable.

Alkaptonuria is an interesting urinary condition which has frequently led to errors in the conclusion drawn from the copper reduction test. The urine, when exposed to the air, becomes dark in colour, and the colour is deepened on the addition of an alkali. On treating Fehling's solution with such a urine, the mixture assumes a brown colour, gradually deepening to black, and a distinct copper reduction takes place on boiling. The abnormal characters of the urine are due, not as was at first thought to a body which was turned "alkapton," but to the presence of pyrocatechin, uroleucic and homogentisic acids. In the allied condition, carboluria, the coloration of the urine is due to oxidation of pyrocatechin and hydrochinon.

The occurrence of alkaptonuria is of importance, not so much from any pathological significance which it is known to possess, as from its liability to be mistaken for glycosuria from its decided copper reducing power. Some time ago a urine was submitted to me for an opinion, as the practitioner had found a marked copper reduction in testing with Fehling's solution, but there was no clinical evidence of diabetes. The patient was an elderly gentleman who was in robust health, and had merely consulted his doctor on account of constipation. The urine was normal in quantity and specific gravity. It was of a rather deep reddish-brown colour. The reaction was acid, and there was no albumin. On treating Fehling's solution with the urine the mixture immediately became of an inky-brown colour, and on boiling there was distinct copper reduction. The fermentation test was negative, and treatment with phenyl-hydrazin yielded no osazon. On leaving the urine in a glass exposed to the atmosphere the upper part became markedly deeper in colour. The condition was typical of alkaptonuria not glycosuria, and was no doubt to be ascribed to the constipation from which the patient suffered giving rise to intestinal putrefaction and the decomposition of tyrosin in the intestine. A number of similar

urines have come under my notice. Futcher (4) records an analogous case where the sufferer was treated by several specialists at different health resorts, and whose life was refused by several Life Assurance Offices on the ground that he suffered from diabetes. The substances grouped under the term "alkapton" are found in normal urine in varying amount, a flesh diet giving a larger excretion than a mixed diet. Various observers have estimated the quantity as from 3 to 6 grammes in twenty-four hours, or 0·2 to 0·4 per cent.

Pyrocatechin has an active influence upon Fehling's solution. If 2 c.c. Fehling's solution be treated with 0·01 grm. pyrocatechin a deep green colour results, while 0·02 grm. gives a porter colour with distinct copper reduction. Hydrochinon passes into the urine as an etherial sulphate. Very dilute solutions of this body give a deep brown colour with Fehling; 0·00125 grm. will cause distinct copper reduction, while 0·0035 grm. will reduce all the copper in 2 c.c. Fehling's solution.

It is not the intention of this paper to discuss the difficulties which may arise from the presence in the urine of glucosides other than glucose. Much help may then be obtained from the crystalline form of the osazon crystals. Each has its more or less characteristic appearance, and can be recognised under the microscope, a point which is not sufficiently appreciated. The observation of the melting-point of the crystals is a difficult observation which the clinical physician cannot be expected to carry out.

In conclusion, it might be urged that only under the most exceptional circumstances can kreatinine or uric acid cause any error in the copper reduction test. The change in colour caused by the bodies grouped under the term alkapton is so characteristic that there should be no difficulty in its recognition. No reduction of copper is likely to occur except in the presence of glucose, if the observation be carried out at a temperature below the boiling point. The practitioner usually boils his mixture of Fehling and urine. In this manner errors may creep in from reducing bodies other than sugar. If the urine and copper solution be boiled separately, the test-tubes then removed from the flame, and after an interval of thirty seconds the urine be added to the copper solution, if glucose is present reduction takes place, but no reduction occurs from the presence of the less actively reducing bodies. If any doubt remain, the phenyl-hydrazin and fermentation tests are easily applied and will give very satisfactory results.

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2. THE PERIPHERAL THEORY OF NERVE REGENERATION WITH SPECIAL REFERENCE TO PERIPHERAL NEURITIS

By R. A. FLEMING, M.A., M.D., F.R.C.P.Ed., Assistant Physician to the Royal Infirmary

IT may not be out of place to preface this paper by a brief description of the position of opinion with regard to the question of nerve regeneration. There are two theories, each of which has its supporters, and the first is the old theory which we all, I think, held, and which many of us are unwilling to relinquish.

I. The old or central theory was that regeneration occurred only from the central end of a divided nerve, the nerve fibres growing downwards into the peripheral segment, either as (1) the result of the original nerve fibres themselves growing downwards, or (2) the result of the parent axis-cylinders dividing into a number of young axis-cylinders, probably, it was thought, at the first node of Ranvier above the part of the nerve fibre damaged by the lesion (Strœbe). In the latter case the young axis-cylinders passed downwards inside the old parent neurilemma sheaths. The difficulty as to the development of new neurilemma sheaths for these fibres was overcome by the suggestion that the existing neurilemma nuclei, which had in the degenerative stage proliferated, might supply neurilemma sheaths for the new fibres. The old neurilemma sheaths merely acted as guiding structures for the rapidly growing fibres. Vanlair has even estimated the probable rate of growth of the axis-cylinders in their downward course.

Unfortunately for the continued acceptance of this theory a number of cases of secondary nerve suture were performed in which sensation returned in the realm of the sutured nerve in a matter of twenty-four hours, or more generally two or three days, not very perfectly it is true, but still to a certain extent. Secondary suture, it should be explained, implies that the primary lesion occurred perhaps months, or even two or three years, before the operation, and cases of this kind, with the result referred to above, were described by Bowlby, MacCormac, Kennedy, and many other surgeons.

These cases were too numerous and circumstantial to permit of any doubt as to their accuracy, and the only explanations offered by the supporters of the central theory were the following:—

1. That after division of a peripheral nerve some axis-cylinders in the peripheral end did not degenerate, but became invisible because they ceased to stain. This implied that some of the end-organs must have a certain degree of trophic influence over these fibres. Sensation is always described as being restored earlier than motor power in the cases referred to, and therefore the sensory end-organs were believed to be trophic centres for the sensory axis-cylinders, while it was thought that motor end-organs had no such function or to a much less degree, because motor power returned so much more slowly. In support of this survival of axis-cylinders in the peripheral segment, it was stated by Marie and others that in the central segment some fibres degenerated upwards. While I have stated elsewhere [1] my belief that certain of the fine fibres do degenerate upwards for a short distance, there is no evidence of the correctness of either of the premises upon which this argument rests. In many cases degenerated axis-cylinders can be stained and quite easily recognised, and it is inconceivable that this explanation can be accepted as satisfactory.

2. Anastomosis was also suggested as being sufficient to explain the regeneration to which the rapid return of sensation is due. It might imply that the central axis-cylinders grow by devious paths past the barrier of fibrous tissue, or whatever it is which prevents union of the peripheral and central ends of the divided nerve. This, however, was definitely proved not to have occurred in a number of cases, and therefore it was suggested that from the realm of a neighbouring healthy nerve, nerve-fibres might reach the affected area of the divided nerve. Such a suggestion, it is hardly necessary to remark, is extremely problematical, and absolutely insufficient to explain the cases put before us by the surgeons.

An amputation neuroma is explained according to the central theory by the down-growth of either the original axis-cylinders or else the young axis-cylinders formed by their division, and the typical tumour found so commonly following

[1] *Edinburgh Medical Journal*, February and March 1897.

upon an amputation is due to the efforts of these central axis-cylinders to make their way downwards.

A graft, whether it is a bit of spinal cord or a bit of nerve which is used to bring the two ends of a divided nerve together, is merely a supporting structure for the rapidly growing central axis-cylinders which penetrate the graft from the central end only.

II. The second or peripheral theory is not of new inception, although of recent acceptance, as it dates back to a paper of von Büngner's in 1891, if not to an earlier writer, and has been advanced by Eichhorst, Neumann, Tizzoni, Cattani, Bethe, and amongst embryologists by the work of Beard and others, but it has never been seriously entertained until Kennedy of Glasgow in 1898, and the other day Messrs Ballance and Purves Stewart published papers which have aroused an active interest in the subject. The theory may be dogmatically stated under the following headings:—

1. The peripheral segment of a divided nerve *completely* degenerates, beginning in a matter of a few hours and being nearly complete in three or four weeks.

2. The cells which act as phagocytes for the removal of debris of axis-cylinders and myelin are in the first instance mainly leucocytes, but later connective tissue cells and neurilemma nuclei, which latter proliferate inside the old neurilemma sheaths and form a varying number of cells with large oval nuclei and granular protoplasm. The young neurilemma cells, however, soon become arranged in more or less regular columns and begin to act as neuroblasts. Close to the nucleus of the neuroblast a young, somewhat wavy axis-cylinder is developed, which grows and soon becomes separated from the nucleus by a distinct gap, and later a delicate myelin sheath is secreted or otherwise developed, the neuroblasts eventually forming the primitive sheaths just as in a fully developed nerve fibre.

3. These young axis-cylinders, while they join together to form more or less continuous chains, do not undergo full development until they are united to the central end of the nerve. The existence of these regenerating fibres would explain the possibility of return of sensation in a matter of days or even hours, while the fact that after primary union of a divided nerve, sensation does not return until three or four

weeks have elapsed, would indicate that, by that period regeneration is sufficiently far advanced to permit of some conduction of impulses.

4. At the central end of a divided nerve, all the apparent growth of existing axis-cylinders downwards is in reality of "peripheral" formation, or, in other words, the existing axis-cylinders play an entirely passive part until they become joined on to the peripherally formed fibres; and the proliferated neurilemma cells near the distal end of the central segment act as neuroblasts just in the same way as they do in the distal segment. Thus the amputation neuroma, according to this theory, is entirely of "peripheral" formation.

5. A graft is simply a supporting structure, but instead of regeneration commencing from the central end only, it appears at both the central and peripheral ends of the graft, the neuroblasts invading the graft especially along the line of the blood-vessels.

While I have absolutely convinced myself that this peripheral theory of regeneration is correct, I am extremely unwilling to part entirely with the central; and a considerable amount of work done some years ago, and also recently, at the subject of amputation neuromata, strengthens my resolution not to discard absolutely the central theory. I may state that my conversion to the "peripheral" theory of regeneration was due to my success in getting *paraffin* sections of nerves to stain by Strœbe's method (described below). Strœbe's method was intended by the inventor for celloidin sections, and as they cannot be cut nearly thin enough for the accurate observation necessary, the method never yielded really satisfactory results in my hands until I got sections cut in paraffin to take on the stain. I have held for a number of years that the neurilemma nucleus was trophic for the portion of axis-cylinder it shielded, because the axis-cylinders never break up until the nuclei of their protecting neurilemma sheaths have proliferated. This being so, I feel the more ready to accept the neuroblastic functions ascribed to these cells by the peripheral theory of regeneration.

The photographs which I show demonstrate the correctness of the peripheral view of regeneration, and are taken from some experimental work which I carried out some years ago in connection with nerve cell changes after section of peripheral

nerves. Thereafter I purpose describing my reasons for adhering to the central theory as well as the peripheral, and then lastly to refer to the evidence I have obtained by the microscopical study of the nerves in four cases of peripheral neuritis which is in favour of regeneration as described by those who hold the peripheral theory occurring in at least a certain number of cases of that disease.

The nerves examined were fixed in Müller's fluid and hardened in alcohol in the usual way; they were embedded in paraffin because very much thinner sections can be obtained in this way. The staining method employed was a modification of that described by Stroebe. I use a saturated solution of aniline blue (in water), the specimens are stained in this for 24 or 48 hours, and the results are more certain if a preliminary procedure is carried out, viz., to dip the specimens into water to which a few drops of liquor ammonia is added. The object of this procedure is to render the specimens very slightly alkaline, and so secure a deeper and more regular staining of the axis-cylinders. After staining in aniline blue the sections are decolorised in caustic potash alcohol (a very weak solution) until they become pale brown and somewhat transparent in appearance; they are then washed in pure water till they become pale blue, and thereafter counterstained with a saturated watery solution of saffranine O. With a successful result the axis-cylinders stain bright blue, the nuclei orange and the fibrous tissue a paler shade of the same colour. Should the myelin be even slightly granular, a change probably often an early stage of degeneration, although sometimes probably due to artefact, the granules may also take on a blue stain. In some fibres the slits of Lantermann stain deep blue; the significance of this I am unable to explain. If a specimen has not been properly decolorised, the fibrous tissue and the nuclei may stain blue, and even in some otherwise quite successful specimens a few blue stained nuclei may be observed.

Experimental Sections of the Sciatic Nerve in Rabbits.

While I have examined the nerves of a considerable number of rabbits at various dates after complete division, and where reunion was absolutely prevented by the application of silk

ligatures at two parts of the nerves, I shall only refer to three experiments here.

1. Rabbit (36) killed 20 days after the operation.
2. „ (29) „ 68 „ „ „
3. „ (32) „ 105 „ „ „

In the first experiment there is no evidence of regeneration of axis-cylinders, although the peripheral part of the nerve is completely degenerated and only little fragments of axis-cylinders (which take on the aniline blue stain) are left. The neurilemma nuclei have proliferated and are arranged in columns, but no appearance of young axis-cylinders is visible (see photograph 1). In the second and third experiments there is very marked regeneration which is well seen in photograph 2. The young axis-cylinders have to some extent in Rabbit 29, and to a very marked extent in Rabbit 32, joined end to end to form long chains. These young fibres have a fairly marked myelin sheath, and this is well seen in sections stained by Weigert-Pal's method.

There is no possible explanation for this regeneration in the peripheral segment other than by the "peripheral" theory, as there is no possible communication between the central and peripheral ends of the divided nerve.

I agree with Messrs Ballance and Purves Stewart that regeneration of young axis-cylinders is not evident until at least three weeks have elapsed, although those of my series of experiments which it was possible to use for the purpose of examining into the question of regeneration includes rabbits only. At the end of four weeks I find regeneration is so far advanced that a few young axis-cylinders stain with aniline blue, and by six weeks the process is well advanced.

As I already indicated, I do not feel justified in entirely relinquishing the central theory, and the following points appear to me to militate strongly in favour of the central theory sharing in the process of regeneration.

In the central end of a divided nerve the old neurilemma sheaths are seen to be greatly distended by young axis-cylinders, or what I might more correctly describe as young nerve-fibres with myelin and neurilemma sheaths, while this appearance, which should be equally present in the peripheral segment, were there no central regeneration, is in my specimens

far less markedly seen. If this statement is correct it strongly supports the probability of the central or old axis-cylinders greatly aiding in the process of regeneration. In Messrs Ballance and Purves Stewart's monograph all the sketches they figure of markedly distended old neurilemma sheaths with young nerve-fibres within are taken from the central ends of divided nerves. On the other hand Dr Kennedy of Glasgow has figured some dilated neurilemma sheaths from the peripheral segment distended with young nerve-fibres which were unquestionably regenerated by neuroblasts. While there is nothing to prevent an old neurilemma sheath being dilated in the peripheral segment, the fact that the most obvious dilatation occurs in the central segment is most suggestive of central neurotisation.

In the second place some of my specimens taken from the central end of a divided nerve appear to show actual division of the old pre-existing axis-cylinders; they might be considered to be young axis-cylinders formed by neuroblasts and making their way upwards to join on to the old central axis-cylinders, but the specimens seem rather to favour the view that they are due to division of the old axis-cylinders. There is one other possible explanation, and that is, that the apparent two or three young fibres within the old neurilemma sheaths are formed by artefact from one old, possibly degenerated, axis-cylinder; this however is unlikely from a careful study of the specimens.

In the third place, while I admit that to some extent an amputation neuroma is of neuroblastic formation, I cannot believe that it is solely formed in this way, because, if a large neuroma is so formed, it would necessarily mean that neuroblasts extended so far downwards, below what might be called their proper sphere of action, that the neuroblasts must be supposed to have almost acquired a malignant tendency and ought to infiltrate muscle and other neighbouring tissues.

Some years ago I rightly or wrongly described the appearance of naked axis-cylinders in the terminal part of a neuroma, and while I may be wrong in this observation I prefer reserving my opinion until I have finished my work at amputation neuromata. There seems to be no very good reason why the old axis-cylinders should not grow downwards after division, very probably under the influence trophic, and perhaps even neuroblastic, of the neurilemma nuclei.

Many cases of peripheral neuritis suggest from a close study of their symptoms and signs that a slow process of regeneration is at work; not such a slow recovery as would result from a purely central regeneration, but a regeneration occurring all the way down the affected nerve. The toxin in peripheral neuritis, whatever that toxin may be, acts not merely on the nerve cells in the cord, posterior nerve root ganglia, etc., but acts also on the nerve fibres and I believe the blood-vessels. The arteries, especially these of smaller size, the arterioles, and the capillaries are all greatly thickened, the intimal nuclei being especially proliferated to a remarkable degree, so as to interfere with the supply of blood to the area to which the vessel goes. These changes were originally described by Monakow as occurring in this disease, and associated with this vascular change I described the exudations which are so common although not constant in peripheral neuritis. I endeavoured to connect the occurrence of these vascular changes and exudations with the marked degeneration of the fine medullated fibres, which I noted as being constant in all cases of peripheral neuritis in which the nerve fibres had degenerated to any appreciable extent at all. I might perhaps also be allowed to add that I explained the fact so commonly found in peripheral neuritis, namely, that the degenerated parts of the nerve were not always continuous but were often interrupted by a bit of nerve which was more healthy, by suggesting that the exudation might account for the more degenerated parts by the baneful pressure which it produces on the nerve fibres in its neighbourhood. This hypothesis I found was borne out by careful observation of many specimens of affected nerves examined serially.

The same vascular and exudation changes which are found in the nerves, occur to a considerable extent in the muscular and other structures in the affected limbs.

It must be remembered that peripheral neuritis is not always a process of complete nerve fibre destruction, it may be a change in the myelin sheath preventing conduction of normal impulses in a normal way, but not causing much alteration in the microscopical appearances of either the axis-cylinders, or even the myelin, although that is generally somewhat granular. This means abrogation of function without much evident pathological change, and Case IV. of the series of cases of peri-

pheral neuritis referred to in this paper, is mainly of this type. In any case it is rare to find that all the nerve fibres have suffered in peripheral neuritis; it is usual to find that the affected fibres are in little groups, and as I assert, the fine fibres have the greatest tendency to suffer. In the majority of fatal cases of the disease, however, there are a large number of degenerated fibres in all the nerves which are seriously affected.

While I purpose summing up my results after a brief reference to each case, I think it well to say now that it seems a very hard, nay, almost impossible task to expect a fibre degenerated more or less from end to end of a nerve to recover by central regeneration alone; and that if there are neuroblasts which take on the function of nerve regeneration, the process of complete recovery would become much more comprehensible.

There is one matter to which I must refer here. Is it not possible that regeneration may be a process normally at work in every nerve; and if we accept the neuroblastic theory of regeneration, may the regeneration to be presently described in our cases of peripheral neuritis not be either simply what is met with in health, or at any rate an excessive degree of what is a normal process?

I have examined the posterior tibial nerves from a series of ten cases at different ages which were taken at random from the post-mortem room and I can find no obvious evidences of regeneration in any of the cases enumerated below. I am, of course, well aware that degenerative and regenerative processes are at work in all the tissues of the body, but certainly in nothing like the marked degree shown in Case III. of my series of peripheral neuritis, and I can honestly say that after a very careful search I failed to see any definite evidence of regeneration in the posterior tibial nerves of the subjoined "normal" cases.

Female,	A. S.	æt.	8,	died of	osteomyelitis.
„	T. S.	„	15,	„	typhoid fever.
„	J. N.	„	18,	„	acute Bright's disease.
Male,	W. B.	„	32,	„	accident, crush.
„	J. C.	„	41,	„	chronic Bright's disease.
„	W. M.	„	52,	„	septicæmia, extravasation of urine.
„	T. N.	„	61,	„	phthisis.

Male,	J. R.	æt.	63,	died of	sarcoma of upper jaw.
„	W. W.	„	64,	„	severe crush, accident.
Female,	M. B.	„	77,	„	cardiac failure.

Cases of Peripheral Neuritis showing Nerve Regeneration.

CASE I. Mrs H., æt. 38, died in Ward 25, Royal Infirmary, April 8, 1894. The patient was under the care of the late Sir Thomas Grainger Stewart, and a full account of the history was published, along with Dr G. A. Gibson, in the third volume of the Edinburgh Hospital Reports, page 417.

The important facts are the following:—There was a very alcoholic history; a fortnight before admission, numbness, "pins and needles" sensation, and great loss of power developed in both arms and legs. On admission to hospital she complained of great hyperæsthesia to pressure over both nerves and muscles, numbness and "pins and needles" sensation in hands and feet. There was no obvious change in the ability to recognise either tactile or common sense impressions, and there was no delay in the conduction or these sensations. Temperature sense was delayed and somewhat blunted. Muscular sense was found to be markedly impaired. Plantar reflexes were absent, the other skin reflexes were present. The patellar reflexes were absent. Patient had talipes equinus from birth. The flexors in the lower limbs, the flexors and extensors in the forearms, and the muscles of the hands were extremely weak. The Faradic current gave no response in the affected muscles in lower limbs, only very slight response in the muscles of the upper limbs, and this response disappeared the day after admission.

On April 5th patient became cyanosed from paralysis of the diaphragm and lower intercostal muscles. She was kept in life by artificial respiration for sixty-eight hours.

I have given a full account of the changes in the nerves and cord in *Brain*, Spring number 1897, and therefore I only intend to refer to the presence of regeneration.

The patient died just three weeks after the earliest history of sensory and motor symptoms; but as there were complaints of slightly less definite symptoms for a few days before that time, we can date the probable commencement of definite nerve lesions as being from three to four weeks.

Three weeks is the earliest period at which recognisable regeneration can generally be made out, and therefore we expected to find only the earliest regeneration of axis-cylinders present.

The cell changes in this case and the next cannot be very

definitely referred to, because the cord was fixed in Müller's fluid, and no part of it was fixed in corrosive.

The right sciatic and *posterior tibial nerves* both show very early regeneration, but with marked proliferation of neurilemma nuclei; the young axis-cylinders are extremely fine and very short. Similar changes were noted in the corresponding nerves of the left side. Photograph 3 shows regeneration in the right posterior tibial nerve.

The nerve to the left gastrocnemius shows much less marked regeneration than in the other nerves to the leg muscles.

The ulnar nerves show very early regeneration. It is rather difficult to find in a whole section several undoubted young fibres.

The nerves of the arms show less obvious degeneration than those of the legs.

The fourth left intercostal nerve, while it shows proliferation of nuclei, shows no evidence of regeneration at all.

The vagi nerves show well marked degeneration with proliferation of nuclei, and also quite definite although early regeneration.

The nerves in this case show remarkably well the typical vascular changes, the marked exudation so common, I believe, in peripheral neuritis, and they bear out my statement that the fine fibres have suffered most severely. The larger nerve-fibres, especially in the arm nerves, show far more change in the myelin sheath than definite disintegration of the whole nerve fibre. The change referred to is a somewhat granular one and gives the nerve fibre a swollen appearance, and with it there is a certain amount of proliferation of nuclei. The fine fibres have, as just stated, suffered more than the others, and therefore we look for regeneration in the parts of the nerves where the fine fibres should be. The fact that the regeneration is very early, and yet that the appearances differ from anything seen in the normal nerves examined, bears out my contention that it is not a process markedly met with in normal nerves, and that it is associated with the process of repair.

CASE II. This case is also fully described in the paper in *Brain*, Spring number 1897. I shall therefore only refer to the chief changes collectively, and the nerves which show regeneration.

Mrs M., æt. 38, was admitted to the late Sir Thomas Grainger Stewart's wards in November 1896, suffering from marked paralysis of both arms and legs, difficulty in swallowing, and loss of speech. Her illness dated back for three months, but she had only been absolutely confined to bed for the preceding three weeks. The patient had a long-standing

reputation for great excess in the consumption of alcohol, both beer and spirits. There was no history of diphtheria.

When the case was examined in hospital the patient was so stupid that the exact condition of the sensory functions was very difficult to determine. There was great hyperæsthesia over both the nerves and muscles of the limbs, the skin was evidently markedly anæsthetic, the skin and tendon reflexes were abolished, and the electrical changes, if not showing the complete reaction of degeneration in some of the affected muscles, showed at least an incomplete reaction in all. Death occurred from involvement of the diaphragm.

All the nerves examined showed the vascular exudation and fine fibre changes referred to already, and comparatively few healthy nerve fibres were to be found in the nerves of the limbs.

The *posterior tibials* show extremely little regeneration, but as already indicated, very marked and advanced degeneration. Photograph 4 is taken from the right posterior tibial nerve of this case.

The *left posterior tibial* really shows no regeneration at all, while the *left internal popliteal* shows a very early and localised trace of regeneration, the region of the fine fibres being the usual, but not the only site for its occurrence.

The *nerve* going to the *seventh right intercostal muscle* showed marked degenerative changes, but no evidence of regeneration.

The *ulnar*, *musculo-spiral* and *musculo-cutaneous nerves* were examined by Strœbe's method, and all show extremely advanced degeneration and very early regeneration, the last two nerves mentioned showing far better regeneration than the ulnar.

This case is instructive because it is one with a long history, but only in the final three weeks was the patient absolutely helpless, and during that time instead of any apparent improvement the case steadily went from bad to worse. We have no right to expect much regeneration, and we certainly do not get it.

CASE III. Mrs S., died in Ward 6, 2nd December 1896, while under Dr Gibson's charge. Unfortunately the records of the ward at that time have been mislaid, and I can only give a very rough sketch from my own notebook made at the *post-mortem* examination.

There was complete paralysis of both arms and legs when the patient was admitted to hospital, but a very considerable amount of improvement occurred during her stay in the wards. She died of paralysis of the diaphragm and heart failure.

The following are the points of importance gathered from the *post-mortem* records (performed by Dr Muir).

The *body* was extremely pale but not emaciated. The calf muscles were distinctly atrophied.

The *heart*, 11 oz., showed marked fatty changes, partly degenerative.

The *lungs*, *right*, 1 lb. 7 oz.; *left*, 1 lb. 5 oz.; are both somewhat œdematous and congested at the bases.

Liver, 4 lbs. 12 oz., showed fatty infiltration.

Spleen, 15 oz., was uniformly enlarged; pulp moderately firm and pale, and showed subacute congestion.

Kidneys, *right*, 8 oz.; *left*, 8½ oz.; both show some cloudy swelling, and the capsules are beginning to become adherent and the surface very slightly granular in places.

Muscles.—Atrophied calf muscles, looked anæmic with yellowish streaks in places, the result of fatty changes.

Nerves showed nothing abnormal to naked eye examination.

Brain showed marked anæmia and slight œdema, the surface convolutions were a little atrophied and the sulci widened. The pia-arachnoid showed opalescent thickening.

Nerve cells.—The cord, medulla and posterior nerve root ganglia were examined by myself. Many of the anterior cornual cells, especially in the lumbar and the cervical enlargements, showed chromatolysis with disappearance of much of the chromatic substance, and in some cells its accumulation around the nucleus. Many of the nuclei have an eccentric position, and there are numerous cells which show vacuolation. It should, however, be stated that a number of cells are apparently normal.

The posterior nerve root ganglia belonging to the sciatic region of the cord contain many cells showing similar changes to those described above. The proportion of affected cells is about the same as in the anterior cornua of the cord.

Right sciatic nerve.—There is marked degeneration, especially in certain groups of fibres, and the fine fibres have especially suffered. The connective tissue trabeculæ in the neighbourhood of the fine fibres are greatly thickened, and there is considerable proliferation of nuclei especially in the same region, and to a less extent in connection with the other degenerated fibres. There are the same vascular changes in the arterioles and capillaries which have been already referred to. There is distinct regeneration, and most unquestionably it is due to neurilemma nuclei acting as neuroblasts. The difficulty in recognising the young axis-cylinders is due to the fact that the regeneration is best marked in the groups of fine fibres although it is by no means confined to these regions alone.

Right posterior tibial nerve.—Shows more marked degeneration but less advanced regeneration. The vascular changes are very obvious.

Left sciatic—and *left posterior tibial nerves*—correspond to

the descriptions given of the same nerves on the opposite side, but the degenerative changes are rather less distinct. None of these nerves show much exudation with the vascular changes, and I might add that no case of such marked peripheral neuritis has come under my notice in which the exudation was so slight.

The calf muscles were examined and showed that the transverse striation was not so marked as it is normally, while there was distinct increase in the number of the sarcolemma nuclei.

The *median nerves* on both sides were also examined and both showed extremely marked regeneration. The degenerated fibres were similar in distribution to those seen in the other nerves of this case. Photograph 5 is taken from the right median nerve of this case.

CASE IV. D. C., æt. 50, was admitted to Ward 26 under Sir Thomas Fraser's charge on the 23rd December 1897, and died 4th March 1898.

This patient had a very alcoholic history and the main form of intoxicant was beer, of which the patient drank enormous amounts. There was a history of onset of present illness three weeks before coming into hospital.

There is not merely considerable anæsthesia below the knees, but patches of anæsthesia over parts of the trunk up to the fourth rib. Superficial reflexes are present, but the knee-jerks are absent. There is slight drop foot on both sides and great loss of control over the legs, in fact, beyond slightly bending the legs at the knees he cannot move his legs to any extent. He cannot stand and he cannot sit up in bed without assistance. There is a good deal of fibrillary tremor in the tibialis anticus and other muscles of both the arms and legs. The results of the electrical reactions were somewhat conflicting. There was partial reaction of degeneration, but the nerves reacted to a fairly strong Faradic current. Muscular sense is described as being much impaired in arms and legs.

The diaphragm acted sluggishly even on the patient's admission to the hospital. For six weeks after admission patient improved and the legs began to recover power, while there was a considerable return of sensation over the regions previously described as being anæsthetic. The diaphragm still continued to act unsatisfactorily and the patient died partly of heart failure and partly of septic pneumonia.

The *post-mortem* was performed by myself and the chief points of interest were as follows:—

Body emaciated, muscularity poor, especially of legs, the arm muscles being rather less atrophied. The abdomen was retracted.

Heart, 13 oz., was slightly fatty; orifices, etc., are fairly healthy; right heart somewhat dilated.

Lungs.—Right, 2 lbs. 14 oz. There is lobar pneumonia of middle lobe in stage of yellow hepatisation. Towards basis of lower lobe there are small areas of septic pneumonia (inspiration). *Left*, 1 lb. 6 oz., is fairly healthy.

Liver, 4 lbs. 10 oz., shows fairly marked "nutmeg" condition.

Spleen, 12 oz., was soft and diffluent—there are numerous small hæmorrhages. Appearance is suggestive of ptomaine absorption.

Kidneys show no special change worthy of note.

The *diaphragm* is very thin, soft and flabby, and of a very pale colour.

Brain, *cord* and *nerves* showed no gross naked eye lesion.

Microscopic Appearances of Cord, Ganglia and Nerves.

Cord.—A very few of the multipolar cells in the anterior cornua show the nuclei to be eccentric in position, a larger number show a distinct degree of chromatolysis, and many show vacuolation of protoplasm. These changes are best marked in the cervical and lumbar enlargements.

Posterior nerve root ganglia of cervical and lumbar regions.—Most of the cells are fairly normal in appearance, but a number show chromatolysis, eccentric position of nuclei and vacuolation of protoplasm.

In both this case and the last case I believe the affected cells and nuclei are distinctly atrophied, or rather are smaller in size than those which are unaffected. The cells in medulla and pons, and also in parts of the cortex of brain, were examined, and no abnormal change was observed.

The *nerves.*—It has not been possible to get the nerves of this case quite finished, and therefore I can only refer to a few of them.

The *sciatics* and *posterior tibials* show very marked vascular changes, and a small amount of exudation, mostly in the neighbourhood of the vessels.

The larger nerve fibres appear swollen and their myelin granular, but many of these fibres so affected show no proliferation of neurilemma nuclei, and no evidence of any disintegration of the axis-cylinders.

The fine fibres have suffered especially, but in place of as marked regeneration as I expected there is great thickening of the connective tissue trabeculæ where the groups of fine fibres once were. Some of the larger fibres are degenerated in the

ordinary way, but comparatively few, and when these are found, and among the remains of the fine fibres, a small amount of neuroblastic regeneration is evident. The arm nerves showed the same changes so far as they have been examined.

The *phrenic nerves* show very marked degeneration with disintegration of myelin and axis-cylinders and proliferation of neurilemma cells. In both phrenics a very early stage of regeneration is seen, but it is by no means general throughout the nerves.

The diaphragm is extremely thin and the muscle fibres show marked loss of their normal striation with some proliferation of nuclei.

So far as I am aware regeneration of nerves, according to this peripheral or neuroblastic theory, has not yet been described in peripheral neuritis. It takes much careful study and close observation to recognise the early stages of regeneration, and sometimes it is almost impossible to do so, and it is only where it is fairly evident that its existence can be recognised by anyone not conversant with nerve tissues in health and disease.

As noted already the fine fibres suffer the most in peripheral neuritis, and it is in the regions of the fine fibres that we look for regeneration with the greatest certainty of finding it. I believe all the fine fibres in a peripheral nerve are medullated, and therefore there is a gap or space between the axis-cylinder and the nucleus. In the earliest stages of regeneration the young axis-cylinders are closely applied to the side of the nucleus of the neuroblast, but when the more advanced stage is reached then they become myelinated and are with difficulty differentiated from the fine fibres except by two characteristics, viz., that young axis-cylinders are more wavy in outline, the other being that there is always associated with the possibility of regeneration the proliferation of neurilemma nuclei. When neurilemma nuclei proliferate they alter in appearance from long, somewhat slender nuclei, to swollen, more oval-shaped nuclei.

There seems little object in surmising as to the exact clinical phenomena which indicate commencing regeneration, because all we can definitely say is that some nerve fibres which are only partially affected by the toxin certainly recover without regeneration; while in all in which the myelin and the axis-cylinders have become broken up and the neuri-

lemma nuclei proliferated, recovery must be mainly dependent on neuroblastic regeneration. Return of sensory and motor functions will certainly be important indications of regeneration, but they may also be due to recovery of nerve fibres whose myelin has alone suffered from some limited and curable toxic process, whether that process is degenerative or inflammatory in nature. The number of fibres that degenerate to such an extent that neuroblastic regeneration is an essential curative process is very great in a severe case of peripheral neuritis; and therefore in all severe cases the fact that throughout the whole length of the affected nerve fibres regeneration can and does occur, and that it is not alone dependent on growth downwards from the cell centre, greatly brightens the horizon of hope in marked cases of multiple neuritis. As I have already said, however much one strains the imagination, it seems hardly conceivable that an axis-cylinder process can be regenerated entirely centrifugally throughout a long sensory-motor nerve without some assistance. It seems most probable that where a whole neurone is so damaged by a toxin as to lead to the destruction of the greater part of its axis-cylinder process, recovery would be quite impossible were there no peripheral efforts at regeneration to assist in the process.

I am not in a position to say much from any personal observations as to the regenerative changes in the sensory and motor end-organs, but in all probability an analogous regenerative process is at work there too.

It may be asked what happens to that part of the axis-cylinders of an ordinary peripheral nerve which is not provided with a well-marked neurilemma sheath, as there would be no possible formation of neuroblasts in these regions which are practically entirely situated in the cord? The peripheral nerves are certainly formed embryologically by ingrowth from without and not outgrowth from within, and presumably the neuroblasts are of epiblastic origin. The tracts in the cord and brain which have no neurilemma cell sheaths are formed from the central cells by outgrowth, and therefore it does not require any great stretch of the imagination to believe that in peripheral neuritis those parts of the axis-cylinders which have no primitive sheaths might be regenerated from the cells which are their trophic centres.

It seems reasonable to suppose that the toxin which affects the whole neurone, and as I contend produces more marked changes in the nerves than in the cell centres, should first be neutralised or eliminated from the cell, and that therefore from the cell centre regeneration might extend at least down to that part of the axis-cylinder which is originally of peripheral formation, and is therefore regenerated from the neurilemma cells acting as neuroblasts. On the other hand in cases in which the cell centres are practically destroyed by the toxin, recovery of function is quite impossible, although I contend that as the result of the vascular and exudation changes the degree of nerve degeneration is no criterion of the amount of the central cell destruction.

In conclusion, I do not base my statements as to regeneration in peripheral neuritis upon the four cases I have referred to, as I have found it in the nerves of four other cases of the same disease which proved fatal, but time has not permitted me to have a full account of these cases ready.

3. ON A CASE OF JEJUNAL FISTULA

By HENRY M. CHURCH, B.Sc., M.D., F.R.C.P.Ed.

ALTHOUGH there are several cases of intestinal fistulæ on record, few of these are associated with the jejunum. Indeed it is only since Billroth in 1881 showed that pylorectomy was possible, that jejunostomy has been attempted. That attempt was notably made, and, but for an accident nine days after it, successfully made as far as the operation and results were concerned, in a case of Dr Golding-Bird's, and published in the *Transactions of the Clinical Society*, November 1885. In the following case food was administered solely by the mouth, some of it being discharged from the jejunal wound, giving the patient great distress, and some of it passing on into the bowel.

Miss L., aged 46, underwent operation for acute obstruction of the bowels in 1884 and died in 1892. During these eight years she had a fistulous communication with the upper part of the bowel, and suffered great wretchedness from this condition, especially from a digestive action on the skin occasioned by constantly outflowing pancreatic and biliary

secretions. The short notes I have were taken during the fifteen months I attended her just preceding her death. There was no autopsy, which was much to be regretted. Physiologically considered, therefore, the data are not definite enough to be of value; but from a clinical and pharmacological point of view, the phenomena observed are such as should be recalled, even after the lapse of ten years. In a letter which I received from the late Dr Thomas Keith some years after the operation, he says: "When I saw Miss L. she had stercoraceous vomiting, and was on the point of dying. I opened the abdomen, and found a band constricting the small intestine rather high up. This I divided, and also another band, and found the intestine for 6 or 8 feet below quite narrow and full of contractions and bands. It was nearly dark, and instead of removing 6 or 8 feet of intestine—it was no use—I opened the bowel in the lowest distended portion, and fixed it in the wound. There was nothing else to do. I advised against any attempt to close the opening on account of the narrow state of so much intestine. Ever since the operation there were some bowel contents got through, and the rectum was washed out once a week. I have not seen her for several years, but I suppose she keeps *in statu quo.* There was a lot of trouble for some months from the skin of the abdominal wall getting digested by the pancreatic fluid, which escaped in great quantity." This is Dr Keith's short account of the operation. It would appear that there had been no after attempt to close the fistulous opening. Seven years after this operation I, for the first time, saw the patient. She then had an opening, which could admit the point of my finger, communicating with the bowel just above the umbilicus, from which there issued, more or less constantly, the digestive fluid. As it flowed over the skin it was generally clear like water and odourless, but not of the slimy, syrupy character ascribed to the pancreatic secretion from a very recent fistula. Occasionally there was a flow of green bile, which, like the other, caused a burning pain about the wound. Over a large area round about there was acute inflammation of the skin. The position of the opening a little above the umbilicus, together with the character and time of the discharge, seem to locate it as jejunal.

With the aid of an intelligent nurse, who had been with

her from the beginning, and carefully testing their correctness myself, I recorded a few details of her case, which I now bring before your notice.

Morphine.—Prominent in the case was the invaluable use of morphine. As the nurse said, it used to feed her more than any natural food. Latterly she took as much as 300 drops of solution of morphine in twenty-four hours. It dried up her wound, raised her spirits, and gave her sleep. When it did not dry up the wound, it seemed not only to diminish sensibility, but actually to deprive the pancreatic discharge of its irritating property, as evinced by its diminished action on the skin. Its effects varied with the quantity taken. In large, or even moderate doses, it lessened peristaltic action and caused constipation. It was given in this case in small doses, with the view of lessening the pain in the wound.

Morphine relieved her also in diminishing the reflex excitability of the nerve centres which regulate secretion of the saliva. This was very manifest in her case. With this anti-sialic action there was also diminished flow from the fistula, the pancreatic flow appearing to be generally in proportion to the salivary flow. As a consequence of this dryness of the mouth she suffered much from thirst, but feared to drink fluid to alleviate the condition, knowing the painful consequences of the increased gastric and pancreatic flow which the taking of fluids always caused.

Citrate of Caffeine.—She suffered frequently from headache, which was generally relieved by from 3 to 5 grains of citrate of caffeine. This drug had the opposite effect of morphine in this respect that it always greatly increased the flow from the fistula. It increased also the salivary secretion.

Alcohol.—Alcohol in whatever form administered always increased the flow and irritated the wound. When taken into the mouth it caused considerable reflex secretion of saliva. For these reasons alcohol had to be entirely denied her as a stimulant.

Rhubarb.—Regarding rhubarb, in small doses it quite stopped the discharge for three or four hours, and then it (the rhubarb) came away from the wound and could be both seen and smelt. She always said that rhubarb "was cruelly sore on the wound." Though thus painful in one stage of its action she derived benefit from an occasional dose. My patient's

appetite and general condition were improved by it. To our patient we gave it in small doses as a tonic and astringent, and in large doses it cleared away mucus and bile from the intestinal tube.

Castor oil.—Castor oil was frequently taken by the mouth as an aperient. A large part of it emerged from the fistula in from one and a half to two hours. It was quite unirritating to the wound but increased the flow from it. Other aperients were tried, but it was the only one which did not pain the wound. An enema was employed once a week to clear the lower bowel. It had the disadvantage, however, of increasing the flow from the fistula. If it were administered in the morning the nurse reported that it flowed from the wound all day and far into the night, so that she had often to remain in her chair till three, four, or five o'clock the following morning. It was interesting to note that if castor oil were added to the enema the globules of oil were seen copiously emerging from the fistula some hours afterwards. There seemed to be on these occasions a complete antiperistalsis. Our patient was treated dietetically by enemata, but it was with less comfort than when she swallowed her food.

Any emotion, and this was a marked feature in her case, at once hurt the wound by increasing the flow. There never seemed to be decreased secretion from this cause. Nor was there any marked effect on the bowels below the wound, either way. Cold weather affected her much in the same manner. consequently she was always kept in a temperature of from 70-80°.

As regards her *food*, years of observation showed that foods rich in proteid substances were the most suitable for her. All the time that I attended her she had nothing else than white meat pounded to a cream, and mixed with bread crumbs. This she took warm every three or four hours. She could take nothing cold. Many different foods had been tried in the early part of her illness. Albuminous food was found to support her best and to keep her most free from pain. The nurse specially reported regarding the distress that vegetable diet occasioned. Strawberries made their appearance from the wound. However carefully selected and cooked, vegetables were undigested and came through the fistula with a specially hot and painful discharge, which caused not only

the margins of the wound, but also the surrounding skin, to bleed.

In my case various chemical and mechanical means were employed to protect the skin. The only one that gave relief was tannic acid frequently applied in weak solution to the immediate neighbourhood of the wound, and as an ointment over the surface of the abdomen. This substance diminished the vascularity of the skin and at the same time proved inimical to the ferment of the digestive juices and to bacterial processes in the skin. In my own case the suffering from the extensive area of skin digestion was very constant. So great was it that many a time she regretted that the medical profession had given its *fiat* against euthanasia to end such a life as hers or words to that effect. But for the use of morphine internally and tannic acid externally life would have been unendurable. The case suggests points both of surgical and medical interest. Should, for instance, the attempt have been made to close by operation the wound after the viability of the gut had become re-established, or, at all events, so to reduce it as to prevent the regurgitation of food. The latter alternative would have allowed the adjustment of a tightly fitting tube, directed downwards into the bowel, through which the patient could have been partially fed while the necessity lasted. The smaller the fistulous opening, the greater manifestly would have been the advantage from all points of view.

In conclusion, if the very few notes which I was fortunate enough to take before her death can be turned to practical account for the benefit of others, I venture to hope that this poor lady may not have suffered for these eight years in vain.

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